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STUDIES OF
ELEMENTARY-SCHOOL READING
THROUGH STANDARDIZED TESTS

By

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CHAPTER I

THE PROBLEM

The purpose of this monograph is to present the results of an investigation made to determine the achievement of boys and girls in oral reading and in silent reading. In the study of oral reading achievement was based on the rate of reading and on the number of errors of various types which were made. In the study of silent reading achievement was based on the rate of reading and on the ability of the pupils to reproduce what was read and to answer specific questions concerning the subject-matter of the tests.

The pursuance of this investigation has involved the additional problem of organizing and standardizing tests for use in measuring reading achievement. In this connection an attempt was made to derive reading tests which would secure data that were productive along the following lines: (*a*) in presenting clearly certain characteristic differences between oral and silent reading; (*b*) in comparing the achievement of individuals, classes, schools, and entire systems in oral reading and in silent reading; (*c*) in revealing sources of strength and weakness in the achievement of pupils; (*d*) in showing the influence of certain factors on achievement, such as methods of teaching, sex, nationality, etc.; (*e*) in determining the correlation between significant phases of reading, such as speed and comprehension in silent reading.

The report of this study divides itself naturally into the following parts: a summary of previous investigations; a description of the tests used in the investigation; a discussion of the derivation and validity of the oral-reading test and of the silent-reading tests; a study of reading in a city system; and a report on special problems in reading.

CHAPTER II

SUMMARY OF PREVIOUS INVESTIGATIONS

Up to the present time more than forty investigations have been made which relate to the measurement of achievement in reading. Many of these investigations have been carried out along similar lines, and they can readily be reviewed as a unit. Some of the investigations have resulted in the development of more or less highly standardized tests of reading. For the purpose of this summary four of these studies, including the tests of Thorndike, Kelly, and Jones, will be discussed separately. In summarizing the investigations which have been made, three purposes have been kept in mind: (1) to give a brief description and criticism of four types of tests which have been devised; (2) to summarize by topics the methods and results of the studies which have been carried on up to the present; and (3) to present a descriptive bibliography to which investigators interested in the problem of measuring reading achievement may refer.

DESCRIPTION AND CRITICISM OF FOUR STANDARD TESTS

STANDARDS IN MECHANICS OF ELEMENTARY READING

This test was devised by R. G. Jones (20:37),¹ of Rockford, Illinois, to test a pupil's ability to recognize words at sight. It consists of a series of words which appear most frequently in ten widely used primers. A section of the Teacher's Check Card is given below. The words listed in the table are the words upon which the pupil is tested. The numbers to the left of the words indicate the "recurrent values," or the frequency of occurrence of these words in the primers which were analyzed. The numbers in the horizontal line at the top of the table refer to the pupils tested. The entries (*X*) in the table indicate in each case that the word at the left was missed by the pupil.

When the words of the test were originally selected, they were carefully analyzed into sight and phonic words. "In the phonetic

¹ See pp. 26 ff. for all such references.

list were tabulated all of those simple English words that belong to the 150 common phonetic families. These are mostly words of a single syllable. In the sight list were tabulated various irregular words that do not employ one of the common phonograms, and most words of two or more syllables" (20:38). After the tabulation was complete the words were arranged in the order of their frequency of occurrence in the ten primers analyzed.

In giving the tests an investigator may use the two standard vocabulary lists and make separate tests or he may choose words from both lists and make a single composite test. The test is given as follows: A card on which the words are printed in primer type is placed in the hands of the pupil. The teacher has at hand a card similar to the one shown in Table I. As the pupil pronounces the

TABLE I
TEACHER'S CHECK CARD (PHONETIC)

	Pupil									
	1	2	3	4	5	6	7	8	9	10
1,101 bit.....	X	X	.....	X	X	X	.....	X	X	X
831 hand.....										
731 stay.....										
622 ran.....										
611 ill.....	X	X			X					X
541 pin.....										
489 cow.....										
433 that.....										
426 hot.....										
403 shake.....	X	X			X					X
395 ten.....										
391 ball.....										
359 gun.....										
315 dig.....										
309 like.....										
288 corn.....	X	X	X	X	X	X	X	X	X	X

words of his list the teacher checks on her card the words upon which the pupil fails. The column then presents a fair picture of the pupil's ability to recognize the words which were listed. When all the columns are filled, the card presents a picture of the ability of a class. Thus individual ability, together with the effectiveness or ineffectiveness of class teaching, can be quickly determined. The score of a pupil is determined by finding the sum of the recurrent

values of all the words pronounced. The class score is determined by finding the average of the individual scores.

The test as it has just been described measures the ability of pupils to recognize individual words at sight. It is open to the objection that the words in the list are not in their natural setting. A pupil may not recognize an isolated word, but will recognize it at once in context. In order to meet this objection, Jones organized sentences in which these words are used and has printed them as reading lessons. As the pupil reads these lessons the teacher checks the errors on her score card. Individual and class scores are determined as described above.

As the test is organized it serves as an excellent device for measuring a pupil's ability to recognize simple words at sight, either in isolation or in context. A question arises concerning the validity of a method of calculation which accepts the recurrent values of these words as an index of their difficulty. It would be in harmony with pedagogical principles to find some of the more difficult words occurring in our primers more frequently than some of the less difficult words in order to give the pupil a larger number of opportunities to master them. Whether or not difficulty of pronunciation is complicated by factors other than frequency of recurrence in primers was not discussed in detail. It remains therefore for Jones to establish the validity of his assumption.

Thorndike's (43:209) Reading Scale A for visual vocabulary.—The purpose of this scale is to measure the ability of a pupil to know the meanings of single words seen. It was designed for pupils of Grades IV–VIII inclusive, but may be used in the third grade, and is useful in the high school to some extent. A reproduction of the test is given below.

THORNDIKE READING SCALE A

VISUAL VOCABULARY

Write your name here.....

Look at each word and write the letter *F* under every word that means a *flower*.

Then look at each word again and write the letter *A* under every word that means an *animal*.

Then look at each word again and write the letter *N* under every word that means a boy's *name*.

Then look at each word again and write the letter *G* under every word that means a *game*.

Then look at each word again and write the letter *B* under every word that means a *book*.

Then look at each word again and write the letter *T* under every word like *now* or *then* that means something to do with *time*.

Then look at each word again and write the word *GOOD* under every word that means something *good to be or do*.

Then look at each word again and write the word *BAD* under every word that means something *bad to be or do*.

4. camel, samuel, kind, lily, cruel.
5. cowardly, dominoes, kangaroo, pansy, tennis.
6. during, generous, later, modest, rhinoceros.
7. claude, courteous, isaiah, merciful, reasonable.
8. chrysanthemum, considerate, lynx, prevaricate, reuben.
9. ezra, ichabod, ledger, parchesi, preceding.
10. crocus, dahlia, jonquil, opossum, poltroon.
- 10.5. begonia, equitable, pretentious, renegade, reprobate.
11. armadillo, iguana, philanthropic.

The test is given as follows: A preliminary test similar to Scale A is given by way of preparation. This enables the teacher to make sure that each pupil understands exactly what is to be done. Copies of Scale A are then given out with these instructions: "Read what it says. Do what it tells you to do. Do your best. Hand in your paper when you have marked all the words that you know" (43:219). Each pupil is allowed sufficient time to complete the test. When the pupil hands in his paper, it is quickly examined to determine if any of the exercises have been omitted. If the paper is incomplete, the pupil is asked to finish the test. The papers are scored by determining the number of wrongly marked and omitted words in each line. "The highest numbered line that a pupil does with one (or no) omission or error is taken as his score or measure. Similarly, the highest numbered line that the average of a class does with not over one omission or error is taken as the measure for the class" (43:208).

From the standpoint of objectivity, accuracy, and precision the scale has been carefully planned. It is easily given and a large number of pupils may be tested at the same time. The records can be scored by relatively untrained testers if necessary. The scale can be increased by alternate series, so that pupils may be tested

a number of times without danger of giving special training on the scale words used. The scale measures ability to understand printed words unconfused with ability to express one's self orally or in writing. All of these points are in its favor.

Thorndike calls attention to the following limitations of the scale: (1) the small number and variety of words of each degree of difficulty; (2) the omission of pronouns, conjunctions, prepositions, auxiliary verbs, and other words expressing relation; (3) the possibility that the scale measures a mixture of general stupidity, indolence, or mischief with inability to understand words; (4) the fact that a pupil has one chance in eight of being right by a mere guess.

As previously stated, the test measures the pupil's ability to understand printed words only well enough to classify them. A fundamental question arises concerning the practical value of such measure. Thorndike maintains that as long as the degree of understanding which is measured is objectively defined it makes almost no difference what degree of understanding is measured. If the test is a scientific scale *per se*, the point of view is probably valid. If the test is to be of greatest value for practical schoolroom purposes, it should measure achievement along the line of some clearly defined and highly desirable school product. If we do not know at present just what degree of understanding could be measured with greatest profit, further investigation and analysis should be undertaken to determine the degree of understanding most frequently required in the various grades.

Thorndike's (44:445) Scale Alpha 2 for measuring the understanding of sentences.—The purpose of this scale is to measure the ability of pupils to understand the meaning of sentences and paragraphs. As prepared for use in the grades, the scale consists of a series of seven carefully graded exercises. The two simplest exercises are presented below.

SCALE ALPHA 2. FOR MEASURING THE UNDERSTANDING OF SENTENCES

SET I. DIFFICULTY 4 (APPROXIMATELY)

Read this and then write the answers. Read it again if you need to.

John had two brothers who were both tall. Their names were Will and Fred. John's sister, who was short, was named Mary. John liked Fred

better than either of the others. All of these children except Will had red hair. He had brown hair.

1. Was John's sister tall or short?.....
2. How many brothers had John?.....
3. What was his sister's name?.....

SET II. DIFFICULTY 5.25

Read this and then write the answers. Read it again if you need to.

Long after the sun had set Tom was still waiting for Jim and Dick to come. "If they do not come before nine o'clock," he said to himself, "I will go on to Boston alone." At half past eight they came, bringing two other boys with them. Tom was very glad to see them and gave each of them one of the apples he had kept. They ate these and he ate one too. Then all went on down the road.

1. When did Jim and Dick come?.....
2. What did they do after eating the apples?.....
3. Who else came besides Jim and Dick?.....
4. How long did Tom say he would wait for them?.....

The scale is printed in two sheets, one containing Sets I-IV inclusive, the other Sets IV-VII inclusive. In measuring the ability of a class the more difficult sets are not given except in the higher grades. The tests are given in order, beginning with the easiest. Forty minutes are allowed for the test, though most pupils finish well within that time. Hence the time required to perform the test is not considered in scoring the results. A carefully devised method of scoring the results is presented and tables are included for determining the exact numerical statement of the reading ability of the class. In general, the scale fulfils the standards of objectivity, definiteness, exactitude, and convenience.

Scale Alpha 2 measures the ability of pupils to understand the meaning of sentences and paragraphs. Hence it measures one of the most valuable results sought by the school. The specific type of reading ability which is tested is careful analytic reading, such as accompanies problem-solving or grammatical analysis. Hence the test measures only a limited phase of one's ability to get meaning from sentences, and it emphasizes a type of mental ability which is more characteristic of older children than of younger. The time element is not considered; hence one of the important factors which make for efficiency in reading or study is omitted. Inasmuch

as the scale consists of a synthesis of various elements, such as harder and harder paragraphs and questions of varying degrees of difficulty, the results can be used only as a gross measure of a pupil's ability to understand sentences. As Thorndike clearly admits, it would be much more valuable if the scale were so devised that it would reveal the specific causes of strength or weakness in the individual's gross achievement. In spite of the limitations which have just been pointed out, this test secures a body of objective data which are very instructive to the classroom teacher, and the results may serve as the basis for intelligent criticism of instruction along certain general lines.

The Kansas silent-reading test.—This test was developed and standardized by Dean F. J. Kelly (25:63), of the School of Education, University of Kansas, while director of the training school in the State Normal School at Emporia. The entire test consists of carefully graded groups of exercises, one for the primary grades, one for the grammar grades, and one for the high school. The following exercises are chosen from the sixteen exercises which form the test for Grades III, IV, and V:

NO. 2. VALUE 1.2

Think of the thickness of the peelings of apples and oranges. Put a line around the name of the fruit having the thinner peeling.

APPLES ORANGES

NO. 5. VALUE 1.6

If you would rather have a dollar than a little stone, do not put a line under dollar, but if you would rather have five dollars than a pencil, put a line under stone.

DOLLAR STONE

NO. 16. VALUE 8.9

If in the following words *e* comes right after *a* more times than *e* comes just after *i*, then put a line under each word containing an *e* and an *i*; but if *e* comes just before *a* more often than right after *i*, then put a line under each word containing an *a* and an *e*.

RECEIVE FEATHER TEACHER BELIEVE

At the time the test is given the teacher and pupils study the instructions together by way of preparation. A type exercise is given in the instructions. It is presented and discussed in such a

way that the pupils should know exactly what is to be done. When the teacher is confident that all the pupils understand the instructions, the signal is given to begin. At the end of five minutes the test is discontinued and the papers are collected. The results are scored as follows: "Every answer given is counted either as wholly right or wholly wrong. Where the child's answer is incorrect, cross out the value indicated for that exercise in the margin. Add the values of the exercises which are correctly answered. The sum is the child's score" (26:20). The correct answers to some of the more difficult exercises are given as a safeguard in scoring.

This test has been used widely in various parts of the country and it has been highly recommended by many. Professor E. A. Turner, director of the training school of the Illinois State Normal University, who has used the test in his school, made the following comments concerning it in a recent bulletin: "This test will appeal to practical school men. It is definite, simple, and easily presented. The results can be quickly and definitely determined. In practicability it ranks with the Thorndike and Ayres handwriting scales" (45:28). These are very commendable points and their value should not be depreciated.

The principles which guided Kelly in the organization of his tests were in substance as follows: The ability to get meaning from the printed page is a complex ability, dependent upon many different factors. The two main factors, each one dependent upon a variety of causes, are the speed with which the reader can get over the lines and the accuracy with which he can comprehend the meaning. In the interest of simplicity it was desirable to combine these two factors in a single mark. The plan was adopted, therefore, of measuring the child's ability to read by the number of reading exercises which he could comprehend accurately in a given time. In order that ability to get meaning might not be confused with ability to reproduce meaning in a written composition, the written interpretation of the exercise was reduced to a minimum. Furthermore, Kelly endeavored to devise a test which would test ability to get meaning from the printed page, unconfused with the difficulty caused by obscure words or the lack of a particular fund of information.

A careful study of the exercises reveals the fact that the difficulties of the selections are determined by a combination of various factors, even though Kelly attempted to avoid this difficulty. The exercises vary widely as to vocabulary and construction. In some cases the exercise contains very few words and in other cases the task imposed on memory is much greater. Some exercises require a direct, straightforward type of reasoning; other exercises are comparable to a puzzle. If the scale were to be one of reasoning through reading, it would seem better to reduce difficulties of vocabulary and construction to a common level and have the difficulties in reasoning increase by a series of equal increments. If, on the other hand, it is to be purely a reading test, it would seem that the difficulties in reasoning should be kept more on a common level and those of vocabulary and construction, or both, should increase by a series of equal increments.

Furthermore, the test as devised confuses ability to comprehend the problem which is suggested in a given exercise and ability to solve the problem. Evidence comes from many sources that pupils fail to put down the right answer, although they are able at the time to state the character of the answer desired. According to the method of scoring which is used, each correct answer indicates perfect comprehension, while all incorrect answers are interpreted as indicating no comprehension. This interpretation, as we have shown above, is unjust in many cases. It would seem, therefore, that in trying to avoid the confusion of comprehension and reproduction Kelly has introduced another confusion the significance of which cannot be overlooked.

TOPICAL SUMMARY OF METHODS AND RESULTS OF READING INVESTIGATIONS

Most of the reading investigations which are summarized under this heading have been carried on with large groups of children under ordinary classroom conditions. Some of them may be criticized from the standpoint of scientific accuracy. They are included in this summary because of the suggestiveness of the methods which were employed. A number of laboratory investigations of reading are included for the same reason. Each investigation which

is reported merits separate discussion. The topical method of summarizing these studies has been chosen because of the added emphasis which such a summary gives to certain important issues connected with methods of testing reading.

Subject-matter for tests.—The subject-matter for reading tests has been chosen from sources unfamiliar to the pupils and from familiar sources, and, in some cases, it has been composed by the experimenter to meet the special needs of the test. Waldo (47:13) selected reading material from a school paper. This was given to the pupils for the first time in the test itself in order that the material might be unfamiliar to all. Starch (42:9), on the other hand, selected passages from grade readers. He justifies this procedure on the ground that passages are then chosen which are best adapted to the reading capacity of children. He further states that "there is every indication on the basis of the tests made thus far that the familiarity gained in ordinary reading in school with any passage will not appreciably affect the tests unless the reading has been done very recently, say within a month preceding the test" (42:11). The writer has found that pupils who have read a selection but once recognize it immediately as one that they have read after an interval of one year. Before re-reading the story many pupils were able to reproduce with considerable accuracy its essential points. These facts have led the writer to favor the plan of selecting unfamiliar passages for the test. Gilliland (13:13) composed several passages to meet certain requirements of his tests. This plan has many advantages, especially if the composer is a fluent writer.

Number of selections used.—Investigators differ in their practice relative to the number of selections used in a test series. Courtis (7:376) used the same passage for all grades from the fourth through the high school and university. This method makes it possible to use a constant body of material upon which to base rate and reproduction scores. The method is open to the criticism that the passage is not equally well adapted to the reading capacity of all the students tested. Starch (42:2) selected a graded series of passages as test material. He considers that it is highly important to adapt the reading material to the vocabularies and the range of ideas of

the respective groups of pupils tested. This he does by selecting a passage appropriate for each grade. Oberholtzer (28:319-22) gave separate selections to each grade. He did not check the difficulty of the passages in any way. He gave each grade two tests with passages which were appropriate for the grade. The average results were used as speed records. The validity of this method depends largely upon the appropriateness of the selections. Waldo (48:255) used a test series consisting of two selections, one of which was used for the third and fourth grades and the other for the fifth, sixth, seventh, and eighth grades. Waldo failed to have either the fourth or the fifth grade read both selections. Hence it was impossible for him to compare the achievement of the pupils in the lower grades with the achievement of the pupils in the upper grades.

Form in which the material was presented to the pupils.—Many investigators presented the material to the pupils in whatever form it happened to be printed when selected, while other investigators have modified the form somewhat in order to secure more satisfactory results. Waldo (47:13) used copies of *Current Events*, a school paper. He distributed the papers face down on each desk. At the signal to begin the papers were turned over and the pupils began reading at an assigned point. Oberholtzer (29:3) used selections chosen from school readers. Each pupil opened his book to the page preceding the one on which the class was to read. At a signal each pupil turned the page of his book and began to read immediately. Brown (5:481) used printed selections of about a page and a half in length so arranged as to have the form of the two pages of an open book. When the printed selections were passed out, they were placed face down on the pupils' desks. At a signal each pupil turned his paper and began to read. Courtis (8:47) used specially printed materials. None of the methods described above takes into account the fact that the average reader must read a few lines before he assumes his habitual rate. This can be easily provided for in the case of Oberholtzer's test by having the class read together a portion of the preceding page before turning to the test passage.

Duration of test.—Some investigators who carried on their investigations under laboratory conditions used a definite amount of

subject-matter and made a record of the time required to complete the reading. This method has the advantage that there is a constant body of material upon which to base records of speed and of comprehension. The method has a serious limitation in the fact that large groups of pupils cannot be tested at the same time. Most investigators have required pupils to read for a definite period of time, marking the amount read during the reading interval. This method enables the investigator to secure records from large groups of pupils at the same time. The objection to the method has been offered that some pupils may not record accurately the amount of subject-matter read. Furthermore, the number of ideas read by the various pupils differs, and as a result it is very difficult to devise an equitable basis upon which to grade reproductions.

Among the investigators who have used time as the basis for determining the length of the reading test, practice differs as to the length of the reading interval. Starch (42:7) had the pupils read for thirty seconds. He supports this practice by citing check tests, which showed that the average amount read per second was practically the same whether the reader read for thirty seconds or for a longer period of time. The subjects in the check tests were adults. His results would have been more convincing had they been secured from children. The majority of investigators have adopted one minute as a convenient reading interval. The work of Curtis (8:47) and of Brown (5:481) may be cited as illustrations. Oberholtzer (29:3) adopted a reading interval of two minutes, and Waldo (47:13) adopted an interval of five minutes. The objection to the longer periods is a very practical one. As the quantity of reading material increases, we may naturally expect that the amount reproduced will increase. The longer the reproductions the more arduous becomes the task of scoring the results.

Means of indicating the portion of the selection read.—The investigators who have the pupils read a given amount of material are not confronted with this problem. The times at which the reader begins and ends his reading are noted and the total interval is entered on the record sheet. Various methods have been used to indicate the amount read when the pupils read for a definite interval

of time. Courtis (8:47) and others had the pupils draw a line around the last word read. Oberholtzer (29:3) had the pupils write down the last word read. This method might lead to some errors, since the same word may appear in each of several lines. This objection can be overcome easily by having pupils record the last sentence or portion of the last sentence read. There is a distinct advantage in having pupils write down rather than mark the last words read. In case the same printed selections are to be used by other pupils, the marks left by previous groups may influence the pupil unduly in the reading rate which he assumes and in the position at which he places his mark.

Who shall give the tests.—Abell (1:283) had the students secure their own time records before coming to class. This method allows the widest range of conditions under which the test is given. Very careful instructions may enable mature students to eliminate most of the errors. It is questionable whether results secured in this way by elementary-school pupils are worth much. Waldo (47:13) had the same teacher give all the tests in the various rooms, thus eliminating those errors caused by differences in the people giving the tests. Oberholtzer (29:2) and others, as Courtis and Starch, had the teachers of the various rooms give the tests to their respective groups of pupils. This method has the advantage that the normal conditions of the classroom are not disturbed as they would be if a stranger were introduced. A source of error lies in the fact that many teachers are untrained in the technique of giving tests. It is pointed out in the report of the Cleveland Survey (23:256) that each teacher who gives tests for the first time finds herself somewhat confused and liable to error. If a sufficient number of preliminary practice tests are given by the teacher, this source of error can be largely eliminated.

Directions given to the pupils concerning speed and comprehension.—There is common agreement among investigators that the pupils should be told that they will be questioned concerning the subject-matter read. Practice differs, however, relative to the information given to pupils concerning speed. Mead (27:346) says nothing concerning speed, but tells the pupils that when they have finished the reading they will be asked to write all they can remember of what was read. Oberholtzer (29:3) gives practically the

same instructions, telling the pupils that they should read the passages in such a way that they will be able to report to him at the end of the reading. Brown (5:481) tells the pupils that they will be asked to tell what they have read, but that it is desired that they read as much as they can and get the thought. The practice of Brown, all other things being equal, is likely to secure the fairest results. To stress either thought or speed to the exclusion of the other may lead to undue emphasis of one or the other phase of reading. To emphasize both phases in the instructions is likely to lead to more equal distribution of effort during the reading.

Terms in which rate is expressed.—Most investigators have expressed the rate in terms of the number of words read per minute or per second of time. Starch (42:7) expressed rate in terms of the number of words read per second. Courtis (8:51) expressed rate in terms of the number of words read per minute. Pintner (32:335) used the number of lines read per minute as the unit for rate. Since the lines in different books vary more in length than do the words appropriate for a given grade, it seems much better, if comparisons are to be made, to express rate in terms of the number of words read per minute or per second.

Average rates may be secured by finding the average number of words read in a given unit of time or by finding the average amount of time required to read a given passage or selection. The average in each case may be expressed in terms of the number of words read per second. Attention is called to the fact at this point that erroneous conclusions will be reached if one compares an average rate secured by one method with an average rate secured by the other method. To illustrate this point, the following data are presented:

Pupil	No. of Words Read per Second	No. of Words Read per Minute	No. of Seconds per 100 Words
A.....	$1.33\frac{1}{3}$	80	75
B.....	$1.66\frac{2}{3}$	100	60
C.....	2.00	120	50
D.....	$2.33\frac{1}{3}$	140	42.8
E.....	$2.66\frac{2}{3}$	160	37.5
Totals.....		600	265.3
Averages.....		120	53.06
No. of words per second.....		2.00	1.86+

The table shows the number of words read per second by each of five pupils; also the number of words read per minute and the number of seconds required to read 100 words. The average results expressed in terms of the number of words read per second differ. Hence if two groups of pupils of equal ability were tested and the average rate for one group were found by one method and the average rate for the second group were found by the other method, the results would differ, and any comparison based on these results would lead to erroneous conclusions concerning the relative ability of the two groups. The two mean or average results described in the foregoing illustration are known respectively as the arithmetic mean and the harmonic mean. Yule (*An Introduction to the Theory of Statistics*, p. 129) points out the fact that the harmonic mean always gives the smaller average. Hence investigators, when making rigid comparisons of average rates in reading, should select average rates which have been derived by the same method.

Methods of testing comprehension.—Practically all investigators have tested comprehension by having pupils write a reproduction of what they have read as soon as the reading has been completed. Pintner (32:335) and Oberholtzer (29:3) are good illustrations. Waldo (47:14) used answers to questions in addition to a reproduction. Most of his comparisons are based on answers to questions alone. Kelly (25:64) raises objections to the reproduction method in the following terms: "It is generally agreed, I think, that the ability to reproduce is quite a separate ability from the ability to get meaning, and, therefore, it seems advisable to have a test of the ability to get meaning which involves a minimum of reproduction." The position taken in this monograph is that the mental processes involved in getting meaning are varied and complex. Each of the tests mentioned above measures certain phases of comprehension. A great variety of methods may and should be used in a thoroughgoing test of one's ability to get meaning. Neither a reproduction test, nor answers to questions, nor Kelly's test, nor all combined, serve as a complete test of comprehension.

Methods of scoring comprehension—answers to questions.—Waldo (47:14) prepared a set of ten questions covering two columns of

reading material. If the pupil read all of the subject-matter covered by the ten questions, he received a grade of 10 per cent for each question answered correctly. If the pupil read the subject-matter covered by five questions, a grade of 20 per cent was given for each question answered correctly. The question arises concerning the validity of ranking a person who answers three out of five questions right on a basis of equality with another person who answers six out of ten questions right.

Scoring reproductions.—Most investigators have scored reproductions by the “idea-counting” method. The analysis of a passage into ideas is illustrated by Freeman (22:371) as follows:

In our town | when a boy had a coon | he had to have a box turned upside down | to keep it in | and he had to have a little door in the box | to pull the coon out through | whenever he wanted to show it to other boys | or look at it himself | which was forty or fifty times a day | when he first got it.

The plan involves determining the total number of ideas correctly reproduced by the reader and expressing this number in terms of the ratio of the reproduced ideas to the total number of ideas. One of the variations from this general procedure is brought out in the following reference.

Brown (5:481-82) examined each written reproduction carefully and determined the percentage of ideas represented. In ascertaining the number of ideas reproduced by each child, every idea was counted which was in most respects complete and in general correctly stated, even though some of the less important details were lacking. The percentage grade determined in this way applied to “quantity of reproduction.” The reproductions were examined a second time, and only those ideas were counted which were entirely correct in every respect and of which every detail was reproduced, though not necessarily in the words of the original. The percentage grade determined in this way applied to “quality of reproduction.” Comparisons were made on the basis of both quantity of reproduction and quality of reproduction.

The objection to this method of scoring reproductions is that it is very difficult to determine whether or not an idea is correctly enough reproduced to be counted as correct. If carefully done, the task is a laborious one. Several of our leading investigators have

been forced to abandon the method because of its difficulties. The most direct printed statement to this effect is one by Courtis (8:50). "The scoring of the amount of material reproduced proved long and tedious, and very few data on this point are available."

Waldo (47:15) scores the reproductions by counting the total number of words. He criticizes this method as follows: "In many cases the record of the number of words reproduced means practically nothing regarding the ability of the child in comprehension, for some wrote many meaningless phrases and jumbles of words. Often the phrase written related to other subjects called to mind in some way by the reading material. Others wrote briefly, telling excellently in a few words what was read."

Starch (42:7) describes his method of scoring reproductions as follows: "The comprehension is determined by counting the number of words written which correctly reproduce the thought. The written account is carefully read, and all words which either reproduce the ideas of the test passage incorrectly or add ideas not in the test passage or repeat ideas previously recorded are crossed out." This method has the advantage of being much more rapidly applied than the method of correct ideas. Furthermore, as shown elsewhere in this book, Starch's method is less subjective and almost as accurate as are the more painstaking methods.

Index of reading achievement.—Some investigators have expressed achievement in both speed and comprehension in terms of a single index of achievement. Brown (5:482) defines "the reading unit" as follows: "One unit of reading efficiency is a reading ability in which such a rate of reading in words per second is combined with such a power of reproduction that the product of the number representing the rate and the average of the numbers representing the percentages of quantity and quality is unity. A person who can read at the rate of 0.5 words per second and whose quantity of reproduction is 3 per cent and whose quality of reproduction is 1 per cent has one unit of reading efficiency." Waldo (47:17) multiplied the percentage grade by the number of words read per minute in order to derive a single unit of measurement. Gilliland (13:19), after finding the number of ideas reproduced, divided this number by the time in seconds required to read the paragraph,

giving the percentage of an idea gained per second. Thus, if 5 ideas were reproduced from a paragraph and it took 15 seconds to read the selection, the "reading value" would be expressed as $33\frac{1}{3}$ per cent. Theoretically, all of these methods assume that the acquisition of ideas proceeds at a uniform rate throughout the reading interval. In reality we know that this does not occur. Nevertheless, practical considerations justify the acceptance of some index which shows general achievement.

Rate of silent reading.—It is difficult to draw any final conclusions concerning the rate of silent reading from the studies which have been made because of the lack of uniformity in methods of procedure and in the reading materials used. The results of Oberholtzer (29:7), Curtis (8:56), Brown (5:484), and Starch (42:15) are presented in Table II. Brown used separate selections for the

TABLE II
NUMBER OF WORDS READ PER SECOND BY GRADES

	GRADES							
	I	II	III	IV	V	VI	VII	VIII
Oberholtzer.....	.....	.....	2.3	2.6	3.1	3.9	4.7	4.8
Curtis.....	.....	.....	.....	2.6	3.0	3.6	4.1	4.6
Brown.....	.....	.....	2.01	.....	.....	3.17	.....	.....
Starch.....	1.5	1.8	2.1	2.4	2.8	3.2	3.6	4.0

third and sixth grades. Oberholtzer used separate selections for each grade without determining the relative difficulty of these selections. Starch chose selections on the assumption that the rate should progress by equal steps from grade to grade. Curtis used the same selection for all grades. In order to make his results readily comparable with the results of other investigators, Curtis' results are expressed in this table in terms of the number of words read per second.

In spite of the fact that the methods of testing varied in many details, there is surprisingly close correspondence in the results for the respective grades, particularly so for the third grade. The figures in the table reveal the further fact that progress in rate of silent reading continues throughout the grades. In this connection

Courtis (8:51-52) called attention to the fact that the steady progress through the grades reaches adult speed at the ninth or tenth grade and afterward does not vary widely from these constant values. He suggests that a value of approximately 320 words per minute, or 5.3 words per second, for rapid reading and 200 words per minute, or 3.3 words per second, for careful reading represent adult ability and the general limit of productive training. Courtis (7:387) gives the following tentative conclusions concerning the rate of normal and careful reading: "It will be seen that the curve for normal reading rises to a high value and does not reach its maximum until the high-school years. The curve for careful reading, on the other hand, is practically constant from the sixth grade on. This probably means that the rate and character of one's serious reading are fixed in the early school life."

Waldo (47:47) carried on an investigation which showed the importance of the lower grades as a period in which pupils make marked progress in the speed of silent reading. A test was given in the fall and again in the spring to all grades from the third to the eighth inclusive to determine the percentage of increase in the speed of reading. Table III gives the results.

TABLE III
PERCENTAGE OF INCREASE IN READING RATE THROUGH PRACTICE

Grade	Fall Rate	Spring Rate	Percentage of Increase	Grade	Fall Rate	Spring Rate	Percentage of Increase
III.....	76.4	149.1	95.2	VI.....	128.0	130.1	1.2
IV.....	92.7	163.3	76.1	VII.....	122.7	142.8	16.4
V.....	113.0	129.2	14.3	VIII....	147.2	158.9	8.0

Waldo checked the relative difficulty of the selections which were used in the fall and spring tests. Hence a fair degree of reliance can be placed on his conclusions: "These figures show that the lower grades are very important in the development of reading, for there were made the greatest gains in the mechanics of reading. The third and fourth grades nearly doubled their rates from September to March."

Characteristics of slow and rapid readers.—Abell (1:286) pointed out that slow readers read a word at a time, while the rapid reader

grasps phrases, clauses, and sometimes even sentences at a glance. Quantz (34:50) stated that the superiority of the rapid reader is shown by the fact that his memory of the substance of his reading is more exact than that of the slow reader; he introduces only two-thirds as many irrelevant thoughts; and the ten slowest readers show almost double the amount of lip movement that the most rapid do. Dearborn (9:118) found "that one who reads rapidly in a given style and class of subject-matter will read somewhat proportionately faster than a slow reader whatever within certain limits the nature of the style and the subject-matter."

Factors influencing speed.—*a)* Care with which one reads: Courtis (8:50) and others secured results which show quite clearly that one's rate of reading varies with the attention given to the thought of the selection.

b) Familiarity with subject-matter: Dearborn, as quoted in Huey (19:178), found that a reader saved one-third the total reading time the second time he read a given selection.

c) Lip movements: Hendricks (18:22) points out that in the first grade there is no appreciable difference between the rates at which lip movers and non-lip movers read; in the fourth grade lip movers read more slowly than non-lip movers; and in the eighth grade lip movers read decidedly more slowly than non-lip movers. Huey (19:175) points out exceptions to this general rule.

d) Habits of eye movement: Huey's (19:175) observations led him to the following conclusions: "Each would fall into a reading pace that seemed most natural to him and would then read page after page in exactly the same time. . . . Habits of eye movement are doubtless important factors in setting this pace." Dearborn (10:115) supports the same point of view when he says: "It is in the writer's belief clearly indicated by the above experiments that one of the essentials of natural and rapid reading is that the reader's eye should at once be able to acquire a regular and uniform motor habit of reaction for each line." Huey (19:178) points out exceptions to this rule. Hence it is impossible to state definitely at present the extent to which there is correlation between speed in reading and regularity of eye movements.

e) Power of assimilation: Ruediger (37:61) gives the following conclusions in connection with certain of his studies: "After having eliminated the physiological qualities pertaining to the mechanism of vision we saw that neither visual acuity, retinal sensitivity, nor the horizontal extent of acute vision had any significant correlation with reading rate. The essential factors that determine reading must be looked upon as central rather than peripheral. It is not a matter of getting material to the brain, but of assimilating it after it is there." Ruediger points out that the correlation between the number of reading pauses and the reading rate is apparently at variance with the conclusion just given. He states that the fact that more is seen at a fixation by a rapid reader than by a slow reader may just as well be the result of a strong power of assimilation as of more effective vision.

f) Length of words: Slightly different points of view are held relative to the influence of the length of words on reading rate. Beer states that the reading time varies with the character of the words used. Thus a preponderance of monosyllabic words makes the reading time longer owing to the relatively greater meaning conveyed by monosyllabic words. Messmer reported similar results. Dearborn (9:98), in checking up Messmer's experiment, says: "It is not the short words as such, but the words which cannot be easily grouped with others which necessitate separate fixation."

g) Summary of factors: Quantz (34:50), considering all the factors which he found to contribute to rapid reading, said that they are, in the order of importance, "visual perception, practice as determined by amount of reading from childhood on, power of concentration, mental alertness estimated by rapidity of original composition, scholarly ability as decided by college records."

Influence of practice on rate.—Huey and Dearborn each early expressed the belief that the reading rate might be increased by practice. Oberholtzer (29:8) reports an increase of 50 per cent in the rate after two weeks of practice in rapid reading. The tests showed also that oral expression and power to grasp the content were equally improved. Bowden (4:41) reports the results of some experiments with adults concerning the influence of practice on rate

as follows: "The figures show that for these two types of subjects the reading rate may be markedly increased by practice. . . ." Bowden (4:45) reports the effect of practice upon the rate of silent reading of a seven-year-old boy. The practice exercise in rapid silent reading was a ten-minute one daily for forty days. In the first exercise the boy read twelve words in a minute; in the last he read fifty-five words in a minute. Miss Bowden points out that the case is not a typical one, but she believes that the rapid-reading exercise had no small share of influence in the wonderful improvement made by the boy, and that other elementary-school children whose motor habits are not fixed might secure improvement in rate from simple exercises in speed of reading.

Pintner (33:129) performed a series of experiments to determine whether the process of articulation could be eliminated, and if so, whether by practice the ordinary rate of reading and the average degree of comprehension could be attained. His conclusions are as follows: "From the results I think we are justified in saying that reading without articulation can take place, that it can be accomplished as quickly as reading with articulation, and that practice in reading without articulation increases the ordinary rate of reading, no doubt due to the fact that after such practice the amount of articulation made use of is not so great as formerly." Pintner's study does not determine whether articulation can be entirely eliminated from reading.

Comparison of the rates of oral and silent reading.—Most of the studies made show the superiority of silent reading. Oberholtzer (29:7) presents a comparison between the rates of oral reading and

TABLE IV

COMPARISON OF RATES IN ORAL READING AND IN SILENT READING

Grade	Oral Reading	Silent Reading	Grade	Oral Reading	Silent Reading
III.....	2.1	2.3	VI.....	2.8	3.9
IV.....	2.3	2.6	VII.....	3.1	4.7
V.....	2.4	3.1	VIII.....	3.9	4.8

silent reading, as shown in Table IV. These figures show clearly that silent reading is a much more rapid process than oral reading

and that the increase in the intermediate grades is much more marked in silent than in oral reading.

Hendricks (18:16) found that first-grade pupils read somewhat more rapidly silently than orally. In the fourth and eighth grades the increase was very marked, being almost twice as rapid silently as orally in the eighth grade. His data further show the very interesting fact that if pupils are urged to increase their speed of silent reading in the third grade they become confused and read less rapidly. Mead (27:348) tested six sixth-grade classes and found that all classes but one read more rapidly silently. Pintner (32:335) tested fourth-grade children and found that they averaged 20 lines a minute orally and 28 lines a minute silently.

Loss in oral-reading rate during the summer vacation.—P. C. Packer and H. W. Anderson (31:81) tested the rate of oral reading of pupils in the Iowa City public schools in Grades IB–VB inclusive to determine the influence of the summer vacation upon the pupils' reading rates. The rate of oral reading was determined during the latter part of May, 1915, and again on September 18, 1915, after one week of school. All children read from material with which they were familiar, and were allowed any prose selection they liked. The results showed that the pupils' reading rates had been decidedly lowered: "Grade IB read at the median rate of 50 words per minute in May and 44 words in September, a loss of 6 words per minute. Grade IA fell from 84 words to 49 words; Grade IIB from 125 to 68; Grade IIA from 145 to 124. Grade IIIB lost 14 words in its rate. Grade IIIA lost 18 words, and IVB, IVA, and VB lost respectively 14, 13, and 13 words in rate of reading from May to the end of the first week of school in September."

Relation between speed and quality.—Various positions have been taken with regard to this problem. Abell (1:284) stated that comprehension may be independent of absolute rate, since of three classes of readers—fast, moderate, and slow—some comprehend well and others fairly or poorly. Quantz (34:30) found that the rapid readers were on the average about 37 per cent superior to the slow readers in the quality of their work. "The superiority of the rapid reader is also shown by the fact that his memory of the

substance of his reading is more exact than that of the slow reader. He introduces only two-thirds as many thoughts not found in the original selections." Waldo (47:54) plotted the correlation between speed and comprehension for several grades. His conclusion is as follows: "No definite results can be stated, though it would seem that the rapid readers usually are strong in comprehension, although there are many exceptions." Hendricks (18:6) shows distinct positive correlation between speed and quality of silent reading. "In the percentage of thought reproduced the rapid readers excel, giving 91 per cent of the thought as compared with 76 per cent reproduced by the slow readers."

Growth in comprehension.—Because of the wide variations in method and the differences in character of subject-matter used it is difficult to make many comparisons concerning comprehension. Growth in comprehension seems to continue at a more steady rate and to continue longer than growth in speed. Starch (42:15) reports comprehension scores in terms of the number of words written:

	GRADE							
	I	II	III	IV	V	VI	VII	VIII
Words written	15	20	24	28	33	38	45	50

The figures reveal the fact that the progress is steady throughout the grades, the steps of increase averaging slightly more in the upper grades than in the lower.

Comparison of comprehension during oral and silent reading.—Mead (27:34) found that reproductions were slightly superior in all sixth-grade classes tested when the reading was done silently. Pintner (32:336) reported that fourth-grade children reproduced 34 per cent of the points when reading orally and reproduced 40 per cent of the points when reading silently. The advantage seems to lie on the side of silent reading. When we take into consideration the greater amount of subject-matter read per unit of time silently, the argument is decidedly in favor of silent reading.

DESCRIPTIVE BIBLIOGRAPHY OF READING INVESTIGATIONS

The following bibliography contains practically all the classroom investigations which have been published. Such laboratory investigations are included as might prove most suggestive to anyone who wishes to pursue this work further:

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2. Beer, Max. "Die Abhangigkeit der Lesezeit von psychologischen und sprachlichen Faktoren," *Z. f. Psychologie*, LVI (1910), 264-303.

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3. Boggs, Lucinda Pearl. "How Children Learn to Read: An Experimental Study," *Pedagogical Seminary*, XII (December, 1905), 496-502.

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4. Bowden, Josephine H. "Learning to Read" (Master's thesis, University of Chicago, 1911), *Elementary School Teacher*, XII (September, 1911), 21-33.

Reports the results of an investigation to determine how children recognize words. Two experiments are reported: first, an individual study, and, second, a class study.

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27. Mead, Cyrus D. "Silent Reading versus Oral Reading with One Hundred Sixth Grade Pupils," *Journal of Educational Psychology*, VI (June, 1915), 345-48.
Reports the results of an investigation to determine the relative value of oral reading and silent reading as means of securing thought from the printed page.
28. Oberholtzer, E. E. "Testing the Efficiency in Reading in the Grades," *Elementary School Journal*, XV (February, 1915), 313-22.
Reports the results of an investigation with 1,800 pupils in Grades I-VIII to determine the speed of oral and of silent reading.
29. Oberholtzer, E. E. "Testing the Efficiency in Reading in the Grades" (Master's thesis, University of Chicago, August, 1915).
Reports the results of an investigation with 1,800 pupils in Grades I-VIII in Tulsa, Oklahoma, to determine (a) rate of oral reading and of silent reading; (b) rate of reading in successive grades; (c) factors of greatest influence in affecting rate; (d) relation of speed and comprehension.
30. Oberholtzer, E. E. "The Effects of Efficiency Tests in Reading on a City School System," *Fifteenth Yearbook of the National Society for the Study of Education*, Part I (1914), pp. 138-40.
Summarizes briefly the values which resulted from giving tests of reading in his school system.
31. Packer, P. C., and Anderson, H. W. "The Loss in Reading Ability during the Summer Vacation," *Midland Schools*, XXX (November, 1915), 81-82.
Reports the results of an investigation with 566 pupils in Grades I-V in Iowa City public schools to determine the effect of the summer vacation upon the rate of oral reading.
32. Pintner, Rudolph. "Oral and Silent Reading of Fourth Grade Children," *Journal of Educational Psychology*, IV (June, 1913), 333-37.
Reports results of investigation with twenty-three fourth-grade pupils to determine whether the percentage of subject-matter retained or comprehended is increased or decreased by the supposed help of oral reading.
33. Pintner, Rudolph. "Inner Speech," *Psychological Review*, XX, 129-53.
Reports results of experiments to determine whether articulation could be eliminated during silent reading, and if so whether by practice the ordinary rate of reading and the average degree of comprehension could be increased.

34. Quantz, J. A. "Problems in the Psychology of Reading," *Psychological Review, Monograph Supplement*, Vol. II, No. 1 (1897), pp. 1-51.
 Reports the results of an investigation with 50 Juniors and Seniors of the University of Wisconsin to determine the normal and maximum rates of oral and silent reading, and to determine some of the factors and conditions upon which rate of reading depends.
35. Romanes, G. J. *Mental Evolution in Animals* (1884), pp. 136-37.
 Reports the results of an investigation with "practiced readers" to determine the speed of silent reading and the factors conditioning it. Gives certain conclusions concerning the rate of reading and the power of assimilation.
36. Rubins, R. B. "Tests of the Seven Year School" (Master's thesis, University of Chicago, September, 1915), pp. 32-37.
 Reports the results of Gray's reading tests given to 232 grade pupils in Bristol, Tennessee. Steady progress beyond the third grade is reported.
37. Ruediger, W. E. *Field of Distinct Vision*, Columbia Contributions to Philosophy and Psychology, Vol. XVII, No. 1 (1907).
 In connection with laboratory experiments upon the field of distinct vision Ruediger reports results concerning the correlation between the horizontal extent of acute vision and reading rate. Emphasizes the importance of power to assimilate.
38. Salt Lake City Survey. *The Test in Reading* (June, 1915), pp. 154-65.
 Reports the results of Curtis reading tests given to 1,624 pupils of Salt Lake City. Achievement in speed of reading, comprehension of subject-matter, and the correlation between speed and memory tests are given.
39. Schmitt, Clara. "School Subjects as Materials for Tests of Mental Ability," *Elementary School Journal*, XV (November, 1914), 150-61.
 Reports results of tests given to pupils of Grades I-V and to a group of defective children to determine the relative achievement of each group as to speed and errors in oral reading, together with the ability to reproduce and to interpret the subject-matter read.
40. Sholty, Myrtle. "A Study of the Reading Vocabulary of Children," *Elementary School Teacher*, XII (February, 1912), 272-77.
 Reports results of investigation to determine the reading vocabulary of second-grade pupils. Five points were reported: total number of words in reading vocabulary; number of words known in context; number known out of context when seen on instant; number pupils could build up when allowed to see words for some time; number pupils could neither recognize on instant nor build up when given time.
41. Starch, Daniel. *The Measurement of Efficiency in Reading, Writing, Spelling, and English* (College Book Store, Madison, Wisconsin, 1914).
 Presents the subject-matter for silent-reading tests for each grade, gives instructions for administering and scoring the tests, and presents standards of achievement for each grade.

42. Starch, Daniel. "The Measurement of Efficiency in Reading," *Journal of Educational Psychology*, VI (January, 1915), 1-24.
Reports the results of tests given to 3,511 pupils in fifteen schools of Wisconsin, Minnesota, and New York to determine speed of silent reading and comprehension of subject-matter.
43. Thorndike, E. L. "The Measurement of Ability to Read," *Teachers College Record*, XV (September, 1914), 207-27.
Presents preliminary scales and tests for the measurement of achievement in reading along the following lines: (1) a pupil's ability to understand the meaning of words and sentences seen so far as concerns (a) the understanding of words singly, and (b) the understanding of sentences and paragraphs; (2) a pupil's ability to pronounce words and sentences seen in a series of paragraphs arranged in the order of increasing difficulty.
44. Thorndike, E. L. "An Improved Scale for Measuring Ability in Reading," *Teachers College Record*, XVI (November, 1915), 445-67; concluded XVII (January, 1916), 40-67.
Describes the derivation and use of an improved and extended form of the Alpha Reading Scale described in the *Teachers College Record* for September, 1914.
45. Turner, Edwin A. "Standards Employed in the Determination of Teaching Efficiency," *Normal School Quarterly*, Illinois State Normal University, January, 1916, pp. 26-29.
Reports the tests which have been devised for measuring the efficiency of instruction in reading. The studies of Thorndike, Kelly, and Gray are mentioned.
46. Valentine, C. W. "Experiments on Methods of Teaching Reading," *Journal of Experimental Pedagogy and Training College Record*, II (1913), 99-112. Reviewed by E. H. Cameron, *Psychological Bulletin*, XI, 329.
Reports the result of an investigation of the comparative merits of the word and phonic methods of teaching reading.
47. Waldo, Karl D. "Tests in Reading in Sycamore Schools" (Master's thesis, University of Chicago, July, 1914).
Reports results of an investigation in Grades III-VIII in the public schools of Sycamore, Illinois, to determine the growth in speed and comprehension of silent reading during a period of six months.
48. Waldo, Karl D. "Tests in Reading in Sycamore Schools," *Elementary School Journal*, XV (January, 1915), 251-68.
Gives a summary of results presented in a Master's thesis, University of Chicago, 1914, showing the growth made by various grades in speed of silent reading and comprehension of subject-matter during a period of six months.

CHAPTER III

DESCRIPTION OF THE READING TESTS

Tests of oral reading and of silent reading were organized and standardized for use in the investigations which are reported in chaps. vi and vii. The technical details connected with the derivation and standardization of these tests will be discussed in chaps. iv and v. It is the purpose of this chapter to describe only the general features of the tests, to outline the methods of giving them, and to describe how the results are scored.

THE STANDARD ORAL-READING TEST

The oral-reading test which was used in the investigations reported in this monograph consisted of a series of twelve passages arranged in the order of increasing difficulty. The passages of the test are shown on p. 33

Conditions under which the tests should be given.—The value of the results secured through the use of tests depends largely upon the conditions under which they are given. In view of this fact those who gave the tests were instructed to observe carefully the following points:

a) The tests should be given in a well-lighted room, preferably in an office or alcove, or in a room which is free from noises and interruptions.

b) The presence of visitors while the tests are being given is undesirable. Experience has shown that the pupil is disturbed very little by the presence of the experimenter, but that the presence of a third person is distracting. If anyone asks to observe the testing, it is well to refuse the request politely but firmly.

c) The attitude of the experimenter toward the pupil is a very important factor. Greet the pupil with a casual remark of some kind, thus putting him at his ease. During the progress of the test do not say or do anything which would encourage or discourage

1

A boy had a dog.
 The dog ran into the woods.
 The boy ran after the dog.
 He wanted the dog to go home.
 But the dog would not go home.
 The little boy said,
 "I cannot go home without my dog."
 Then the boy began to cry.

2

Once there were a cat and a mouse.
 They lived in the same house. The cat
 bit off the mouse's tail. "Pray, puss,"
 said the mouse, "give me my long tail
 again."
 "No," said the cat, "I will not give
 you your tail till you bring me some
 milk."

3

Once there lived a king and queen in a large
 palace. But the king and queen were not happy.
 There were no little children in the house or gar-
 den. One day they found a poor little boy and
 girl at their door. They took them into the palace
 and made them their own. The king and queen
 were then happy.

4

Once I went home from the city for a sum-
 mer's rest. I took my gun for a stroll in the
 woods where I had shot many squirrels. I put my
 gun against a tree and lay down upon the leaves.
 Soon I was fast asleep dreaming of a group of
 merry, laughing children running and playing
 about me on all sides.

5

One of the most interesting birds which ever
 lived in my bird-room was a blue jay named
 Jackie. He was full of business from morning till
 night, scarcely ever still. He had been stolen
 from a nest long before he could fly, and he had
 been reared in a house long before he had been
 given to me as a pet.

6

The part of farming enjoyed most by a boy
 is the making of maple sugar. It is better than
 blackberrying and almost as good as fishing.
 One reason why a boy likes this work is that some-
 one else does most of it. It is a sort of work
 in which he can appear to be very industrious and
 yet do but little.

7

It was one of those wonderful evenings such
 as are found only in this magnificent region. The
 sun had sunk behind the mountains, but it was
 still light. The pretty twilight glow embraced
 a third of the sky, and against its brilliancy stood
 the dull white masses of the mountains in evident
 contrast.

8

The crown and glory of a useful life is charac-
 ter. It is the noblest possession of man. It con-
 stitutes a rank in itself, an estate in the general
 good will, dignifying every station and exalting
 every position in society. It exercises a greater
 power than wealth, and is a valuable means of
 securing honor.

9

He was six feet tall and his body was well
 proportioned. His complexion inclined to the
 florid; his eyes were blue and remarkably far apart.
 A profusion of hair covered the forehead. He
 was scrupulously neat in his appearance; and,
 although he habitually left his tent early, he was
 well dressed.

10

Responding to the impulse of habit, Josephus
 spoke as of old. The others listened attentively
 but in grim and contemptuous silence. He spoke
 at length, continuously, persistently, and ingra-
 tiatingly. Finally exhausted through loss of
 strength he hesitated. As always happens in
 such exigencies, he was lost.

11

The attractions of the American prairies as
 well as of the alluvial deposits of Egypt have
 been overcome by the azure skies of Italy and the
 antiquities of Roman architecture. My delight
 in the antique and my fondness for architectural
 and archaeological studies verges onto a fanati-
 cism.

12

The hypotheses concerning physical phenom-
 ena formulated by the early philosophers proved
 to be inconsistent and in general not universally
 applicable. Before relatively accurate principles
 could be established, physicists, mathematicians,
 and statisticians had to combine forces and work
 arduously.

the pupil. Give him no hint concerning his progress until the test has been completed.

d) Arrangements should be made with the grade teacher to have the pupils sent to the experimenter. In the first three grades the following plan should be used: At the outset two pupils should be sent to the room in which the tests are being given. While the first pupil is being tested, the second pupil should remain at the door outside the room. When the first test has been completed, the pupil should be dismissed and the second pupil should enter for his test. As soon as the first pupil reaches the classroom, a third pupil should be sent to the door of the testroom. In this way the experimenter always has a pupil at hand to be tested as soon as a subject is dismissed. In the grades above the third two pupils should be sent at first and one thereafter at the end of each five minutes. Slight readjustments may be necessary in regard to the time schedule, since some experimenters learn to test more rapidly than others.

Directions for giving the oral-reading tests.—1. The purpose of this test is to determine the rate of oral reading and the ability of pupils to pronounce words and sentences at sight.

2. When everything is in readiness to begin, hand the pupil a copy of the paragraphs and give the following directions: "I should like to have you read some of these paragraphs for me. Begin with the first paragraph when I say 'Begin.' Stop at the end of each paragraph until I say 'Next.' If you should find some hard words, read them as best you can without help and continue reading." In case a pupil in one of the first two grades hesitates several seconds on a difficult word, pronounce it for the pupil so that he may continue reading. Mark the word as mispronounced.

3. While the pupil is reading, record two sets of facts in regard to the reading, the time required to read each paragraph and the errors made.

a) The time record is secured by noting the exact second at which the pupil begins reading a paragraph and the time when he completes it. The number of seconds required to read the paragraph should be recorded in the margin to the right of the paragraph.

b) In order to illustrate clearly the character of errors and the method of recording them, the following paragraph is inserted:

The sun pierced into ^{many} large windows. It was the opening of October, and the ^{clear} sky was of a dāzzling blue. I looked out of my window and down the street. The white houses of the long, straight street were almost painful to the eyes. The clear atmosphere allowed full play to the sun's brightness.

If a word is wholly mispronounced, underline it, as in the case of "atmosphere." If a portion of a word is mispronounced, mark appropriately, as indicated above: "pierced" pronounced in two syllables, sounding long *a* in "dazzling," omitting the *s* in "houses" or the *al* from "almost" or the *r* in "straight." Omitted words are marked as in the case of "of" and "and"; substitutions as in the case of "many" for "my"; insertions as in the case of "clear"; and repetitions as in the case of "to the sun's." Two or more words should be repeated to count as a repetition.

It is very difficult to record the exact nature of each error. Do this as accurately as you can. In all cases where you are unable to define clearly the specific character of the error, underline the word or portion of the word mispronounced. Be sure that you mark each error. In case you are not sure that an error was made, give the pupil the benefit of your doubt. If the pupil has a slight foreign accent, distinguish carefully between this difficulty and real errors.

4. Each pupil should be allowed to continue reading until he makes at least the following number of errors in each of two paragraphs: 5 errors or more in 40 or more seconds, or 7 or more errors in case the paragraph is read in less than 40 seconds.

Scope of the oral-reading test.—A question naturally arises at this point concerning the scope of the test. To what extent do measures of rate and mechanical errors constitute a measure of oral-reading ability? In the first place, the elementary school must of necessity place considerable emphasis on the mechanics of reading. To the extent, therefore, that the test measures progress along this particular line of school endeavor it becomes a useful tool in checking achievement in oral reading.

In the second place, rate in itself is a very important measure of oral-reading ability. When a child first learns to read, he recognizes words very slowly. As the association between the sight of the symbol and its pronunciation becomes more firmly established, the pronunciation of the word follows more closely upon its sight. This increase in the rate at which pupils recognize words continues throughout the grades. The following figures give the number of words read per second by large numbers of pupils of each grade when reading the third paragraph of the reading test:

	GRADE							
	I	II	III	IV	V	VI	VII	VIII
Words per second.	1.36	2.21	2.42	2.98	3.39	3.54	3.63	3.70

Furthermore, as the subject-matter to be read increases in difficulty, the speed of reading is decreased, although no errors may be made. This fact is shown very clearly in the case of pupil No. 1 in Table VI. Because one's reading rate increases through the grades and because one's rate of reading is influenced by the difficulty of the subject-matter, it is fair to assume that of two readers the one who recognizes words the more readily has the greater ability in oral reading.

Moreover, ability to read rapidly is a fair measure of the mastery which the reader has of the printed page. It was pointed out in the Cleveland monograph, entitled *Measuring the Work of the Public Schools*, that "the poor reader is one who is unable to pass readily from the printed symbol to the meaning. For the poor reader the mere mechanical processes are obstacles and he loses time in trying to perform the preliminary mental acts which are necessary before he can comprehend the passage. In the case of the good reader, on the other hand, the mechanics of the process are very fluent and rapid. The proficient reader has mastered the words and moves on without hesitation to the meaning." The error in relying entirely on rate as a measure of efficiency in reading was also pointed out in the Cleveland monograph.

Again, it has been found that the relative rank in a class which a pupil holds on the basis of the oral-reading test is very closely correlated to the rank given him by his teacher on the basis of general reading ability. Table V presents the ranks of the pupils

TABLE V
COMPARISON OF RANKS OF PUPILS IN SPEYER SCHOOL

Pupil	Rank by Teacher	Rank by Test	Pupil	Rank by Teacher	Rank by Test
Wilda.....	1	1	Grace.....	10	8
Ogden.....	2	2	Donald.....	11	9
Cornelia.....	3	3	Margaret...	12	12
Jack.....	4	4	Hugh.....	13	14
Athea.....	5	10	Rupert.....	14	13
Marion.....	6	11	Muriel.....	15	15
Rosa.....	7	5	Elly.....	16	16
Jessie.....	8	6	Reginald...	17	17
Parker.....	9	7	Lilian.....	18	18

of the sixth grade of the Speyer School, New York City, given in 1914 by the teachers of that school on the basis of general reading ability, and the ranks given to the same pupils on the basis of the oral-reading test. As revealed by the table, the correlation between achievement as measured by the test and achievement as measured in the classroom is very high indeed. Similar comparisons have been made in several grades of the Elementary School of the University of Chicago with corresponding results.

The writer, while giving more than two thousand oral-reading tests personally, observed that pupils who ranked high in the oral-reading test usually gave much better expression to their reading than those who ranked low. C. T. Gray, who worked on reading during 1915-16 in the laboratory of the School of Education of the University of Chicago, experimented with a number of pupils who had taken the oral-reading test. Those pupils who were sent to him with a low rank according to the test usually received a much lower grade on expression than did those who received a high rank.

A specific test for expression was not included in this study for the following reasons: The writer worked for months trying to devise some simple standards by which to judge the quality of expression. No test devised would be accepted as a whole by a

single teacher called into conference. It therefore seemed futile, at the present stage of development of scientific measuring, to include such a test in this investigation.

Method of tabulating data.—For the purpose of computing individual and class scores it is desirable to tabulate the records of the pupils in as convenient a form as possible. To this end either of the following methods may be used: If the investigator is interested in the final score only, the total number of errors made in reading a given paragraph may be recorded on the test sheet under the number expressing the time in seconds required to read that paragraph. This may be done at the time the tests are given. The scores can then be computed quickly from the original test sheets by the method described in later paragraphs of this chapter. If the investigator wishes to make a careful study of the causes of high or low records or if he desires to make productive comparisons of the achievement of individuals, classes, or entire schools, a more elaborate method of tabulation is desirable. The following method of tabulation which was adopted for use in this investigation was found to be effective for the purposes of analysis and comparison: The records for each school were entered on a separate sheet. The

TABLE VI
TABULATION SHEET FOR INDIVIDUAL RECORDS

PUPILS				PARAGRAPH NO. 1						PARAGRAPH NO. 2						PARAGRAPH NO. 3						PARAGRAPH NO. 4									
G	N	S	A	T	G	M	O	S	I	R	T	G	M	O	S	I	R	T	G	M	O	S	I	R	T	G	M	O	S	I	R
II	1	G	7	13	.....	.....	.....	.....	.....	.....	19	.....	.....	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	.....	25	.....	.....	.....	.....	.....	.....
II	2	G	7	15	.....	.....	.....	.....	.....	.....	20	.....	.....	I	.....	.....	.....	20	.....	.....	I	.....	.....	.....	25	.....	.....	.....	.....	.....	.....
II	3	B	8	12	.....	.....	.....	.....	.....	.....	20	.....	I	.....	I	.....	.....	37	I	.....	I	.....	I	.....	35	I	I	.....	.....	.....	I
II	4	G	7	28	.....	.....	.....	I	I	.....	35	.....	.....	.....	.....	.....	.....	38	.....	.....	I	.....	I	.....	63	I	.....	.....	.....	.....	.....
II	5	G	7	19	.....	.....	.....	I	.....	.....	20	.....	.....	.....	.....	.....	.....	38	I	.....	.....	.....	.....	.....	45	I	.....	.....	.....	.....	.....
II	6	G	8	27	.....	.....	.....	.....	.....	.....	39	.....	.....	.....	.....	.....	.....	55	.....	.....	.....	.....	.....	.....	69	I	.....	.....	.....	.....	.....
II	7	B	7	40	.....	.....	.....	.....	.....	.....	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

records for each grade were tabulated as a unit in order from the first to the eighth. Individual records within a grade were entered in the order of achievement from the best to the poorest. The time required to read each paragraph and the number of errors of each type which were made in reading were recorded. Table VI

illustrates the method of tabulation adopted. As presented, it is limited on account of space to the first four paragraphs of the oral-reading test.

Description of tabulation sheet for class and individual records.—The letters *G, N, S, A* under "Pupils" refer to grade, to the rank of the pupil, to sex, and to age, respectively. The letters *T, G, M, O, S, I, R* under each paragraph refer to the following items: *T*, to time in seconds; *G*, to gross errors; *M*, to minor errors; *O*, to omissions; *S*, to substitutions; *I*, to insertions; and *R*, to repetitions. The record of the first pupil entered in the table reads as follows: The pupil was in the second grade, ranked highest in the class, and was a girl, seven years old. She read the first four paragraphs of the scale in 13, 19, 20, and 25 seconds, respectively, with no errors. The record of the last pupil entered reads as follows: This second-grade pupil ranked lowest in the class and was a boy seven years old. He read paragraph 1 in 40 seconds with one gross error and two repetitions. He read paragraph 2 in 46 seconds with two minor errors, two omissions, two substitutions, and one repetition. The other paragraphs were too difficult for him to read effectively.

Standards for scoring.—The problem of scoring results is much more difficult for reading than it is for many other subjects. In arithmetic the problem is a relatively easy one because standards of perfect accuracy can be adopted as the basis for grading. Such a standard in reading would be open to serious objections, since many of our most effective readers make some errors. The scoring of the record of each individual depends upon the facts that a certain number of errors may reasonably be expected for each paragraph and that a certain amount of time must be allowed for the reading. If the pupil exceeds a given time limit or makes more than a given number of errors, the amount of credit which he gets for reading the passage should be proportionately reduced. Upon the basis of the time required for reading and the number of errors made by large numbers of pupils, four standards of varying degrees of severity were adopted as the basis for scoring. The validity of these standards is discussed on p. 76. They are given below in the order of increasing severity.

A record is checked as a failure if:

- A. It is not read because of previous failure.
It is read in 40 or more seconds with five or more errors.
It is read in less than 40 seconds with seven or more errors.
- B. It is not read because of previous failure.
It is read in 30 or more seconds with four or more errors.
It is read in less than 30 seconds with five or more errors.
- C. It is not read because of previous failure.
It is read in 25 or more seconds with three or more errors.
It is read in less than 25 seconds with four or more errors.
- D. It is not read because of previous failure.
It is read in 20 or more seconds with two or more errors.
It is read in less than 20 seconds with three or more errors.

Individual and class scores.—Individual scores were determined by applying each of the four standards to the pupil's record for each paragraph. If the paragraph was read successfully under the conditions of two of the standards, the figure "2" was entered in an appropriate column of the score sheet (Table VII); if the reading met the conditions of one, three, or four of the standards, the appropriate figure was entered on the sheet. As shown in Table VI, pupil No. 7 read paragraph 1 in 40 seconds with three errors. It is apparent that this paragraph was read successfully according to the conditions of Standards A and B. The record does not meet the conditions of Standard C because more than 25 seconds were required to read it and there was a total of three errors. Since the reading was a failure according to Standard C, it was also a failure according to Standard D, which is more difficult. The paragraph was therefore read successfully under two standards.

Paragraph 2 was read in 46 seconds with seven errors. An application of Standard A shows that the reading was a failure according to the conditions of the most liberal standard, and hence a failure under the conditions of each of the more difficult standards. The paragraph was therefore read successfully under none of the standards. In case a paragraph was not read successfully by any of the standards, no entry was made in the table.

In order to secure speed and accuracy in scoring the results, the four standards mentioned above were summarized in the form of the following table:

SECONDS	ERRORS							
	0	1	2	3	4	5	6	7 or More
40 or more.....	4	4	3	2	1	0	0	0
30-39.....	4	4	3	2	1	1	1	0
25-29.....	4	4	3	2	2	1	1	0
20-24.....	4	4	3	3	2	1	1	0
19 or less.....	4	4	4	3	2	1	1	0

The numbers in the horizontal line at the top of the table refer to the number of errors made. The numbers in the left-hand column of the table refer to the number of seconds required to read a paragraph. The entries in the table refer to the number of standards under which a paragraph is read successfully. The table reads as follows: If a paragraph is read in 40 or more seconds with one error, it is read successfully according to four standards; if two errors are made, it is read successfully according to three standards, etc. With the aid of this table it is possible to score individual records with great rapidity.

DESCRIPTION OF SCORE SHEET FOR INDIVIDUALS AND CLASSES

The letters *G*, *N*, *S*, *A* under "Pupils" in Table VII refer to the grade, to the rank of the pupil, to sex, and to age, respectively. The numerals under "Paragraph," refer to the paragraphs of the scale in order. The entries in the table refer to the number of standards under which each paragraph was read successfully. The table reads: The first pupil entered in the table was a second-grade pupil, ranked highest in the class, and was a girl, seven years old. She read paragraphs 1, 2, 3, 4, 5, and 6 successfully by all four standards, paragraph 7 by one standard, and the remaining paragraphs by none of the standards. The total class score and the average class score for each paragraph are presented at the foot of the table. The total class score was determined by finding the sum of the scores for each paragraph separately. These sums were

then entered on the score sheet at the foot of the appropriate columns. Since the highest possible number of successes per paragraph is four times the number of pupils tested, the average score by paragraphs was found by dividing each item of the total score by four.

TABLE VII
SCORE SHEET FOR INDIVIDUALS AND CLASSES

PUPILS				PARAGRAPHS											
G	N	S	A	1	2	3	4	5	6	7	8	9	10	11	12
II....	1	G	7	4	4	4	4	4	4	I	.....	.....	.....	.....	.....
II....	2	G	7	4	4	4	4	2	2	I	.....	.....	.....	.....	.....
II....	3	B	8	4	3	2	1	2	.....	.....	.....	.....	.....	.....	.....
II....	4	G	7	2	4	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
II....	5	G	7	4	3	I	.....	.....	.....	.....	.....	.....	.....	.....	.....
II....	6	G	8	4	2	I	.....	.....	.....	.....	.....	.....	.....	.....	.....
II....	7	B	7	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total class score.....				24	20	15	9	8	6	2	.....	.....	.....	.....	.....
Average class score.....				6	5	3.7	2.2	2	1.5	0.5	.....	.....	.....	.....	.....

Upon the basis of the type of scoring just outlined the steps of difference in difficulty between the paragraphs and the shifts in difficulty from grade to grade have been determined from data for 3,299 pupils and are represented in Table VIII. The derivation

TABLE VIII
A MEASURE FOR ORAL READING

Grade	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
I....	I	.....	2	3	5	6	7	.....	.....	.....
II....	I	.....	2	3	5	6	7	8	.....	10	.....	.....	.....	.....
III....	I	.....	2	3	5	6	7	8	.....	10	.....	11	12	.....	.....
IV....	I	.....	2	3	5	6	7	8	.....	10	.....	11	12	.....	.....	.....
V....	I	.....	2	3	5	6	7	8	.....	10	.....	11	12	.....	.....	.....	.....
VI....	I	.....	2	3	5	6	7	8	.....	10	.....	11	12	.....	.....	.....	.....	.....
VII....	I	.....	2	3	5	6	7	8	.....	10	.....	11	12	.....	.....	.....	.....	.....	.....
VIII....	I	.....	2	3	5	6	7	8	.....	10	.....	11	12	.....	.....	.....	.....	.....	.....	.....

and validity of Table VIII, together with the reasons for the omission of paragraph 4 and paragraph 9 from the table, are discussed in chap. iv.

The horizontal line of numbers at the top of the table marks off twenty equal steps between 0 and 100. These numbers may be

interpreted as indicating either the relative difficulty of the paragraphs or the amount of credit which should be given for the successful reading of the various paragraphs. The Roman numerals to the left of the table refer to the eight grades of the elementary school. The entries in the table refer to the respective paragraphs of the test. The table reads as follows: In the first grade a pupil who reads paragraph 1 successfully should receive a credit of 55 points; for reading paragraph 2 successfully he should receive 10 additional points, or a total of 65 points; for reading paragraph 3 successfully he should receive 5 additional points, or a total of 70 points, etc. The successful reading of paragraph 1 does not represent so great an achievement in the second grade as in the first grade. According to the table, a second-grade pupil receives a credit of 35 points for reading paragraph 1 successfully. Ten additional points, or a total of 45 points, are given for reading paragraph 2 successfully. Five additional points, or a total of 50 points, are given for reading paragraph 3 successfully, etc.

The numerical value of the achievement of a given class was determined according to the following method: The average class score for each paragraph was first found as indicated on p. 42. The average class scores for the second-grade class mentioned in Table VII were as follows: an average of six successful readings of paragraph 1; 5 successful readings of paragraph 2; 3.75 successful readings of paragraph 3; 2.25 successful readings of paragraph 4; 2 successful readings of paragraph 5; 1.5 successful readings of paragraph 6; 0.5 successful reading of paragraph 7. According to Table VIII, 35 points of credit should be given for each successful reading of paragraph 1; six successful readings amount to a total value of 210. To this should be added 10 additional points for each of 5 successful readings of paragraph 2; 5 additional points for each of 3.75 successful readings of paragraph 3; 5 additional points for each of 2.25 successful readings of paragraph 4; 5 additional points for each of 2 successful readings of paragraph 5; 5 additional points for each of 1.5 successful readings of paragraph 6; and 2.5 additional points for 0.5 successful reading of paragraph 7. The total value is the sum of 210, 50, 18.75, 11.25, 10, 7.5, 2.5, or 310. Since there were seven members in this class, the average score for the class was one-seventh

of 310, or 44+. The foregoing description of the method of finding the numerical score for a class has been reduced, with slight modifications, to the series of specific directions which follow:

a) Find the sum of the scores for each paragraph separately, and enter each total score at the foot of the appropriate column on the score sheet.

b) Enter the total score for each paragraph in the column under "Score," in the following table:

Paragraph	Score × Value	Product	
1.....		VALUE FOR PARAGRAPH I GRADE I.....55 II.....35 III.....30 IV.....25 V.....20 VI.....15 VII.....10 VIII..... 5
2.....	10		
3.....	5		
5.....	5		
6.....	5		
7.....	5		
8.....	5		
10.....	10		
11.....	10		
12.....	5		
Total product			
Average class score			

c) The value or credit given for the successful reading of paragraph 1 varies with the grade. These values are given in the column to the right of the table. Enter the appropriate value for paragraph 1 in the blank space in the column under "Value." Thus, the appropriate value for paragraph 1, for the third grade, is 30. The values for all other paragraphs remain the same for all grades.

d) Multiply the score for each paragraph by its value and enter the result in the column under "Product."

e) Find the sum of the products and divide by 4 times the number of pupils in the class. The result is the average class score.

Graphical representation of oral-reading scores.—As was stated in preceding paragraphs, the ability to read a certain passage without error means less on the part of a pupil in the upper grades than on the part of a pupil in the lower grades. Hence grades are to be compared with each other by the recognition of different levels of achievement. These different levels, as determined from a large number of records, can be expressed graphically as indicated by the vertical lines in Diagram I. Each line represents the scale for a grade and begins below at the point where the score of 10 should

be represented. Higher scores can be represented by appropriate distances along the vertical line above 10. In the diagram the lines end at the points where the score of 70 belongs for each grade. The dotted oblique lines above and below, connecting the successive 70's and 10's respectively, indicate the curves of progress which

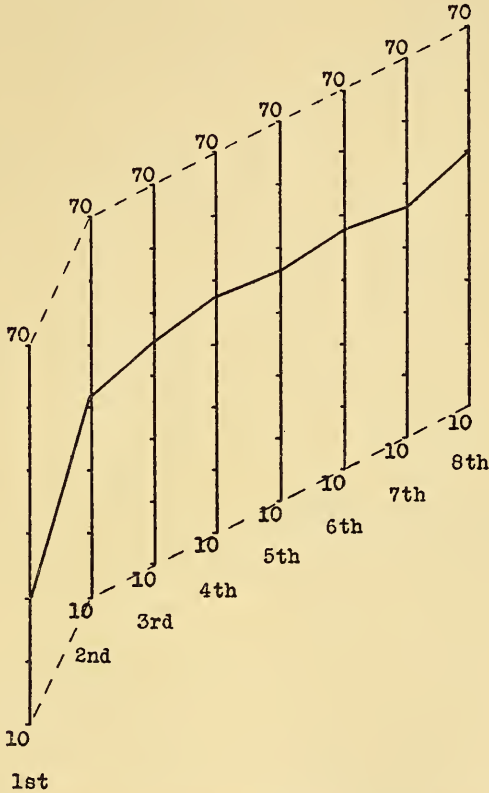


DIAGRAM I.—Progress of 2,193 pupils in oral reading

would result if, in the one case, all scores were 10, or if, in the other case, all scores were 70. The solid line near the middle of the figure represents the record of 2,193 pupils. This average record constitutes a standard with which individual schools may be compared. The numerical value of the record for each grade as represented in the diagram is as follows: First grade, 31; second grade,

Standardized Reading Paragraphs

William S. Gray

School _____ Teacher _____ Grade _____
 Pupil _____ Nationality _____ Age _____

1

A boy had a dog.
 The dog ran into the woods.
 The boy ran after the dog.
 He wanted the dog to go home.
 But the dog would not go home.
 The little boy said,
 "I cannot go home without my dog."
 Then the boy began to cry.

2

Once there was a little pig.
 He lived with his mother in a pen.
 One day he saw his four feet.
 "Mother," he said, "what can I do
 with my feet?"
 His mother said, "You can run with
 them."
 So the little pig ran round and round
 the pen.

3

Once there were a cat and a mouse.
 They lived in the same house. The cat
 bit off the mouse's tail. "Pray, puss,"
 said the mouse, "give me my long tail
 again."
 "No" said the cat, "I will not give
 you your tail till you bring me some
 milk."

4

Once there lived a king and queen in a large
 palace. But the king and queen were not happy.
 There were no little children in the house or gar-
 den. One day they found a poor little boy and
 girl at their door. They took them into the
 beautiful palace and made them their own. The
 king and queen were then happy.

5

One of the most interesting birds which ever
 lived in my bird-room was a blue-jay named
 Jackie. He was full of business from morning
 till night, scarcely ever still. He had been stolen
 from a nest long before he could fly, and he had
 been reared in a house long before he had been
 given to me as a pet.

6

The part of farming enjoyed most by a boy
 is the making of maple sugar. It is better than
 blackberrying and almost as good as fishing.
 One reason why a boy likes this work is that
 someone else does most of it. It is a sort of work
 in which he can appear to be very industrious and
 yet do but little.

7

It was one of those wonderful evenings such
 as are found only in this magnificent region. The
 sun had sunk behind the mountains, but it was
 still light. The pretty twilight glow embraced
 a third of the sky, and against its brilliancy stood
 the dull white masses of the mountains in evident
 contrast.

8

The crown and glory of a useful life is char-
 acter. It is the noblest possession of man. It
 forms a rank in itself, an estate in the general
 good will, dignifying every station and exalting
 every position in society. It exercises a greater
 power than wealth, and is a valuable means of
 securing honor.

9

He was approximately six feet tall and his
 body was well proportioned. His complexion
 inclined to the florid; his eyes were blue and re-
 markably far apart. A profusion of hair covered
 the forehead. He was scrupulously neat in his
 appearance; and, although he habitually left his
 tent early, he was well dressed.

10

Responding to the impulse of habit Josephus
 spoke as of old. The others listened attentively
 but in grim and contemptuous silence. He spoke
 at length, continuously, persistently, and ingra-
 tiatingly. Finally exhausted through loss of
 strength he hesitated. As always happens in
 such exigencies he was lost.

11

The attractions of the American prairies as
 well as of the alluvial deposits of Egypt have
 been overcome by the azure skies of Italy and the
 antiquities of Roman architecture. My delight
 in the antique and my fondness for architectural
 and archaeological studies verges onto a fanati-
 cism.

12

The hypotheses concerning physical phenom-
 ena formulated by the early philosophers proved
 to be inconsistent and in general not universally
 applicable. Before relatively accurate principles
 could be established, physicists, mathematicians,
 and statisticians had to combine forces and work
 arduously.

42; third grade, 46; fourth grade, 47; fifth grade, 48; sixth grade, 49; seventh grade, 47; eighth grade, 48.

Standardized reading paragraphs.—The oral-reading test as given on p. 33 was used in the investigations which are reported in chaps. vi and vii. During the progress of these investigations it was found that several changes were desirable in connection with certain paragraphs. These modifications are described at the end of chap. iv, and they have been incorporated in the test as it appears on p. 46. The revised form of the oral-reading test is the one which was used in connection with the Grand Rapids Survey. Arrangements are now being made to use it in the St. Louis Survey, in a survey of eleven cities of northern Illinois, and in connection with studies of reading in numerous cities throughout the country.

The average oral-reading scores for 4,066 pupils of Grand Rapids are given below:

AVERAGE ORAL-READING SCORES

	DATE	GRADES							
		I	II	III	IV	V	VI	VII	VIII
Grand Rapids	March 1916	35	44	47	49	50	47	48	48

THE STANDARD SILENT-READING TESTS

The subject-matter of the silent-reading tests consists of three selections entitled "Tiny Tad," "The Grasshoppers," and "Ancient Ships." These selections were adapted respectively to the interests and reading capacity of second- and third-grade pupils, fourth-, fifth-, and sixth-grade pupils, and seventh- and eighth-grade pupils. The phases of reading ability which are tested by these selections are rate of silent reading, ability to reproduce the subject-matter read, and ability to answer specific questions concerning what was read.

That speed is an important element in silent reading cannot be questioned. Of two pupils, all other things being equal, that pupil

who reads at the rate of 100 words per minute will achieve only one-half as much in a given unit of time as one who reads at the rate of 200 words per minute. As the diagram on p. 136 shows, the rapid reader usually secures a larger number of ideas from what he reads than does the slow reader. For these reasons it is evident that the facts concerning the rate of silent reading are of the greatest importance to supervisors and teachers.

It will be pointed out on p. 105 that when a person tries to understand what he reads, a number of complex processes are involved, and that meaning or comprehension may take various forms. In the present investigation it was impossible to test comprehension of what was read in all its forms. Practical considerations demanded that comprehension be measured along one or two representative lines. It was decided, therefore, to measure the ability of pupils to reproduce what was read, and to measure ability to answer questions concerning specific points. These two measures were selected because comprehension is tested very largely in the classroom by one or both of these methods.

Subject-matter of the silent-reading tests.—The selections used for the tests of silent reading were printed on cards so that they could be easily handled. Each selection was printed in three sections. The middle section contained 100 words in the case of the easiest selection and 200 words in the case of each of the two more difficult selections. The section at the left of the middle section serves a double purpose: First, it gives the pupil something to read by way of preparation for the test part of the passage; secondly, the tester can readily determine the moment at which the reader moves his eyes from the bottom of the card to the top of the card where the words upon which the time record is based begin. In the following passages the ends of sections are indicated by the short horizontal lines. The passages used are as follows:

TINY TAD

(FOR SECOND AND THIRD GRADES)

Tiny Tad was a queer little fellow with only two legs and a short tail. He was nearly black, too, and much smaller than most tadpoles in the big pond. He could hardly wait for his front legs to grow.

"When I have them all," he said, "I'll leave this dirty water and go up into the orchard. What fun it will be to hop and hop and hop. If only I had a little brother to hop with me, I should be so happy."

It wasn't long before his legs began to grow. He moved about and kicked around until his legs were quite strong. "I am going out on the bank to see if I can hop," he said one night when he was just six weeks old.

The sun was hardly up the next morning when a

little toad jumped out of the water and hopped up on the bank. He was very small, but none too small for the little legs that wobbled under him. It was Tiny, the young toad.

THE GRASSHOPPERS

(FOR FOURTH, FIFTH, AND SIXTH GRADES)

The grasshoppers were among the worst enemies of the early settlers of Nebraska. Their homes were on the high plains and among the hills at the foot of the great mountains in the West. Here they lived and raised their families.

In dry seasons there were more children and less food at home. Then they assembled and flew away in great swarms to the east and to the south. They traveled hundreds of miles. Sometimes on clear, warm, moonlight nights they traveled all night. More often they settled down late in the afternoon and fed, and then continued their way the next day.

The great grasshopper raid took place in September, 1874. Suddenly along the frontier states the air to the west was filled with grasshoppers. There were billions of them in the great clouds which darkened the sun. The noise of their wings filled the air with a roaring sound like a rushing storm, followed by a deep hush as they dropped to the earth and began to devour the crop.

All the corn was eaten in a single day. Where cornfields stood at sunrise nothing remained at night but stumps of stalks swarming with hungry hoppers struggling for the last bite. They stripped the garden patches bare. They gnawed great holes in the rugs and carpets put out to save favorite plants. The buds and fruit of trees were consumed. They followed the potatoes and onions into the ground.

When they finished the garden and green crops, they attacked the wheat and oats in the shock and the wild grass in the unplowed fields. Only two green crops escaped them, broom corn and sorghum cane. They did not seem to have a sweet tooth.

ANCIENT SHIPS

(FOR SEVENTH AND EIGHTH GRADES)

There is no more interesting study to marine architects than that of the growth of modern ships from their earliest form. Ancient ships of war and of commerce equally interest them; but as they study the sculptures and writings of the ancients, they find records of warships far outnumbering ships of commerce.

Among ancient nations the Greeks and Romans were the best shipbuilders. Judging from the description of their works their crafts must have been elegant, swift, and seaworthy. This is more than can be said of many of the more showy productions of the shipyards of Britain, France, and Spain even so late as the Middle Ages.

There is no question now that the ships of the ancients made extended voyages urged by oars alone. A thousand oarsmen were sometimes required to man the sweeps, besides a crew of five hundred soldiers and sailors. Written descriptions give us splendid pictures of fleets of these ancient ships moving swiftly along the white villa-dotted shores of Greece, or majestically sweeping into some mirror-like harbor and with sounding trumpets saluting the setting of the low, western sun.

We are able to make from old records very fair models of these ancient warships. One writer describes the great galley of Philopator as propelled by forty banks of oars. His description is questioned, for however plain the description of these warships may be, no one has yet shown the precise manner in which forty banks could be arranged. A bank of oars means a

row on one

deck, and while there are many pictures of galleys they show nothing more than a trireme, which is a ship of three banks. A ship of forty banks puzzles our imagination.

After the pupil had read the selection appropriate for his grade he was given a sheet of printed directions. On one side of the sheet the directions state that the pupil should write thereon all he could remember of the story which he had read. As soon as he completed his reproduction he turned the sheet and answered the ten questions which were printed there. The questions for each of the selections are as follows:

TINY TAD

1. How many legs did Tiny Tad have at the first of the story?
2. How did Tiny compare in size with most of the other tadpoles in the pond?

3. Which legs did Tiny wish would grow?
4. Where did Tiny say he would go when he got all his legs?
5. What did Tiny wish he had to hop with him?
6. What did Tiny do to make his legs grow strong?
7. How old was Tiny when he decided to leave the pond?
8. What part of the morning did Tiny choose for leaving the pond?
9. How did Tiny get upon the bank?
10. What size was Tiny at the end of the story?

THE GRASSHOPPERS

1. In what western state were the grasshoppers enemies to the settlers?
2. What effect did dry seasons have on the number of grasshoppers?
3. On what kind of nights did the grasshoppers sometimes travel all night long?
4. When the grasshoppers were making their long journeys, what would they often do late in the afternoon?
5. In what year did the great grasshopper raid take place?
6. Like what did the great groups of grasshoppers look as they traveled through the air?
7. What sort of noise did they make when flying through the air?
8. What change was brought about in the appearance of the cornfields by the grasshoppers between morning and night?
9. What did the settlers do to protect their favorite plants?
10. Why didn't the grasshoppers eat the broom corn and sorghum?

ANCIENT SHIPS

1. To whom is the study of the growth of modern ships interesting?
2. How do the records of warships compare in number with the records of the ships of commerce?
3. What peoples were the best shipbuilders among the ancient nations?
4. How did the ancient vessels compare in elegance and swiftness with the more showy productions of the Middle Ages?
5. What kind of voyages were sometimes made by ancient ships when propelled by oars only?
6. What was the total number of men required on some of the ships?
7. Explain clearly what a "white villa-dotted shore" means to you.
8. From what source do we secure the ideas which enable us to make models of the ancient warships?
9. What does a "bank of oars" mean?
10. Why do we question the statement that the great galley of Philopator had forty banks of oars?

Directions for giving the silent-reading tests.—1. The purpose of this test is to determine rate and comprehension in silent reading.

2. Grades II and III are tested on "Tiny Tad," Grades IV, V, and VI on "The Grasshoppers," Grades VII and VIII on "Ancient Ships."

3. The teacher first fills in the four blanks at the top of a report sheet:

Name.....School....., etc.

4. The teacher then hands the pupil a card with the selection appropriate for his grade printed on it, with these directions: "Read the story on this card silently. Read the story from beginning to end without stopping or repeating any of it. Read the story rapidly but carefully. Do not stop reading to ask about difficult words; read them as well as you can. Be prepared to tell the story or to answer any question about it when you are through. Do you understand?" Make the directions clear to the pupil before beginning the reading.

5. Secure the time record as follows: When the pupil shifts from the bottom of the first column to the top of the middle column, note the position of the second hand. When he shifts from the bottom of the middle column to the top of the third column, note the second hand again. Record the number of seconds required to read the middle column. Be sure that your record indicates the time for reading the middle column only. If possible, use a stop watch.

6. If the pupil has been reading "Tiny Tad," ask him to tell you the story of Tiny Tad as well as he can. In the meantime write as rapidly as possible just what the pupil says. Ask the pupil to tell it a sentence at a time if he talks too rapidly. When he discontinues speaking, ask him if he remembers anything else. Following this, ask him the questions and record his answers.

7. If the pupil has been reading "The Grasshoppers" or "Ancient Ships," hand him the report blank to fill out. Ask him to write the story which he has read as well as he can. Impress upon him the fact that he should not look at the questions on the opposite side of the sheet until he has finished writing his story. While the pupil is filling the blank, the next pupil may take the test.

Speed of silent reading.—The speed of silent reading was determined as follows: The average number of seconds required by each grade to read 100 words was determined. This average was then expressed in terms of the number of words read per second by dividing 100 by the average number of seconds required to read 100 words. Diagram II shows the progress of 2,654 pupils in rate of silent reading, representing thirteen city systems, and may be used as a standard for comparison. Since three selections were used in order to adapt the subject-matter to the maturity of pupils

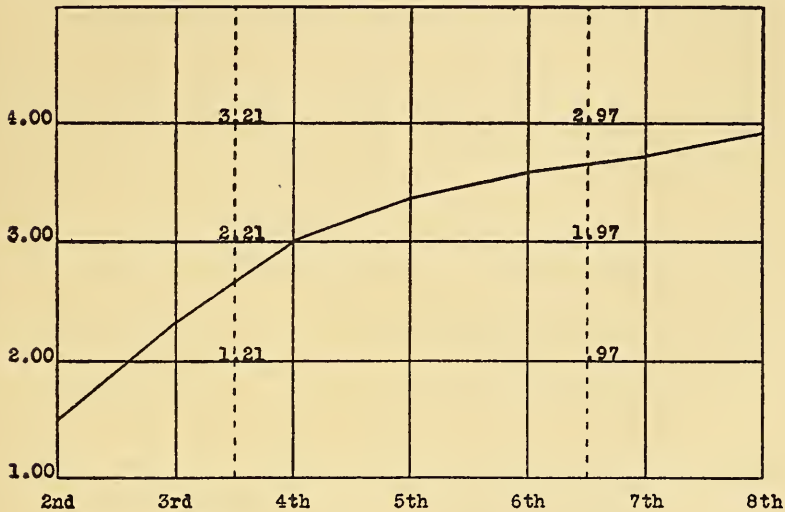


DIAGRAM II.—Progress of 2,654 pupils in rate of silent reading

of different grades, a readjustment was necessary in the diagram. The points of this readjustment are between the third and fourth grades and between the sixth and seventh grades. A dotted line is drawn in the diagram dividing the curves of progress at these points. The figures at the left of the diagram indicate the number of words read per second when the easy selection was read; the figures on the line between the third and fourth grades indicate the equivalent number of words read per second when the second selection was used; and the figures on the line between the sixth and seventh grades indicate the equivalent rate for the most difficult

selection. The average number of words read per second by each of the grades is as follows:

"Tiny Tad"		"The Grasshoppers"			"Ancient Ships"	
Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth
1.50	2.30	2.20	2.57	2.79	2.69	2.87

Quality of silent reading.—The quality of the pupil's reading was determined as follows: All wrong statements, irrelevant statements, and repetitions were checked from the pupil's reproduction, and the remaining words counted. The ratio of these words to the total number of words forms the reproduction grade. For each question

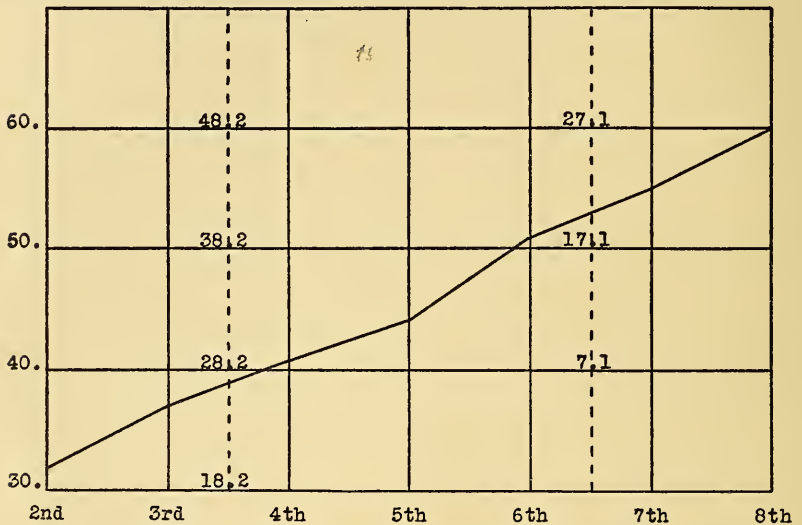


DIAGRAM III.—Progress of 2,654 pupils in quality of silent reading

answered correctly a grade of 10 points was given. The average of the reproduction grade and the grade received for correct answers to questions was found. This average grade formed the quality score in silent reading. The average quality score was then determined. The progress of 2,654 pupils in quality of silent reading is represented in Diagram III. This diagram contains readjustments similar to those described in connection with Diagram II and should be similarly interpreted. The average quality mark for each of the grades is as follows:

"Tiny Tad"		"The Grasshoppers"			"Ancient Ships"	
Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth
32	37	29	32	39	22	27

Revised score sheet.—The score sheet for both the oral-reading test and the silent-reading tests is presented on the following page in the form in which it is now being used. The directions for giving both tests and for scoring the results as described on the back of the score sheet are given on pp. 55-59).

DIRECTIONS FOR GIVING THE ORAL-READING TESTS

1. The pupils should be tested individually in a quiet place where they will be free from distraction and where the remainder of the pupils to be tested will not hear the reading.

2. When everything is in readiness to begin, hand the pupil a copy of the standardized paragraphs and give the following directions: "I should like for you to read some of these paragraphs for me. Begin with the first paragraph when I say 'Begin.' Stop at the end of each paragraph until I say 'Next.' If you should find some hard words, read them as best you can without help and continue reading." Pupils above the fourth grade should begin with paragraph 4. If two or more errors are made in this paragraph, ask the pupil to read the preceding paragraphs also. In case pupils in the first two grades hesitate several seconds on a difficult word, pronounce it for the pupil and mark it as mispronounced.

3. While the pupil is reading, record two sets of facts in regard to the reading: the time required to read each paragraph and the errors made.

a) The time record is secured by noting the exact second at which the pupil begins reading a paragraph and the time when he completes it. The number of seconds required to read the paragraph should be recorded in the margin to the right of the paragraph.

b) In order to illustrate clearly the character of errors and the method of recording them, the following paragraph is inserted:

The sun pierced into ^{many} my large windows. It was the opening of October, and the ^{clear} sky was of a dāzzling blue. I looked out of my window and down the street. The white houses of the long, straight street were a almost painful to the eyes. The clear atmosphere allowed full play to the sun's brightness.

If a word is wholly mispronounced, underline it as in the case of "atmosphere." If a portion of a word is mispronounced, mark appropriately as indicated above: "pierced" pronounced in two syllables, sounding long *a* in "dazzling," omitting the *s* in "houses" or the *al* from "almost," or the *r* in "straight." Omitted words are marked as in the case of "of" and "and"; substitutions as in the case of "many" for "my"; insertions as in the case of "clear"; and repetitions as in the case of "to the sun's." Two or more words should be repeated to count as a repetition.

It is very difficult to record the exact nature of each error. Do this as nearly as you can. In all cases where you are unable to define clearly the specific character of the error, underline the word or portion of the word mispronounced. Be sure you put down a mark for each error. In case you are not sure that an error was made,

give the pupil the benefit of the doubt. If the pupil has a slight foreign accent, distinguish carefully between this difficulty and real errors.

4. Each pupil should be allowed to continue reading until he makes seven errors in each of two paragraphs.

DIRECTIONS FOR SCORING THE RESULTS

1. Score the results for each paragraph through the use of the following table. The numbers in the left-hand column refer to the number of seconds required to read a paragraph. The numbers in the horizontal line at the top of the table refer to the number of errors made in reading. The numbers in the horizontal line to the right of 40 mean that if a paragraph is read in 40 or more seconds with no errors a credit of 4 is given; with 1 error, a credit of 4; with 2 errors, a credit of 3; with 3 errors, a credit of 2, etc.

SECONDS	ERRORS							
	0	1	2	3	4	5	6	7 or More
40 or more....	4	4	3	2	1	0	0	0
30-39.....	4	4	3	2	1	1	1	0
25-29.....	4	4	3	2	2	1	1	0
20-24.....	4	4	3	3	2	1	1	0
19 or less....	4	4	4	3	2	1	1	0

To find the score for a given paragraph, note the time required to read it and the number of errors made. For illustration, paragraph 1 may be read by pupil A in 34 seconds with 3 errors.

In the left-hand column of the table find the time unit which corresponds to 34 seconds. Evidently it is the time unit 30-39.

Follow the horizontal line of numbers to the right of 30-39 to the column which represents 3 errors. The score indicated there is 2.

Enter this score on the score sheet in the column for paragraph 1, opposite the reader's name.

The score for each paragraph should be determined and entered in the same way. Make no entry on the score sheet if the score is 0.

2. Proceed as follows to find the average class score:

a) Find the sum of the scores for each paragraph separately and enter each total score at the foot of the appropriate column on the score sheet.

b) Enter the total score for each paragraph in the column under "Score," in the table on p. 58.

c) The value or credit given for the successful reading of paragraph 1 varies with the grade. These values are given in the column to the right of the table. Enter the appropriate value for paragraph 1 in the blank space in the column under "Value." Thus, the appropriate value for paragraph 1, for the third grade, is 30. The values for all other paragraphs remain the same for all grades.

d) Multiply the score for each paragraph by its value and enter the result in the column under "Product."

e) Find the sum of the products and divide by 4 times the number of pupils in the class. The result is the average class score.

3. Individual scores may be found as follows:

a) Do as directed in b), c), and d) in the directions for finding the average class score.

b) Divide the sum of the products by 4. The result is the individual score.

c) The average class score may be found by finding the average of the individual scores.

Paragraph	Score × Value	Product	
I..... 5		VALUE FOR PARAGRAPH I GRADE I.....55 II.....35 III.....30 IV.....25 V.....20 VI.....15 VII.....10 VIII..... 5
2.....	..... 5	
3.....	..... 5	
4.....	..... 5	
5.....	..... 5	
6.....	..... 5	
7.....	..... 5	
8.....	..... 5	
9.....	..... 5	
10.....	..... 5	
11.....	..... 10	
12.....	..... 5	
Total product			
Average class score ...			

DIRECTIONS FOR GIVING THE SILENT-READING TESTS

1. Grades II and III are tested on "Tiny Tad;" Grades IV, V, and VI on "The Grasshoppers;" Grades VII and VIII on "Ancient Ships."

2. The teacher then hands the pupil a card with the selection appropriate for his grade printed on it, with these directions: "Read the story on this card silently. Read the story from beginning to end without stopping or repeating any of it. Read the story rapidly but carefully. Do not stop reading to ask about difficult words; read such as best you can. Be prepared to tell the story or to answer any question about it when you are through. Do you understand?" Make the directions clear to the pupil before beginning the reading.

3. Secure the time record as follows: When the pupil shifts from the bottom of the first column to the top of the middle column, note the position of the second-hand. When he shifts from the bottom of the middle column to the top of the third column, note the second-hand again. Record the number of seconds required to read the middle column. Be sure that your record indicates the time for reading the middle column only. If possible, use a stop watch.

4. If the pupil has been reading "Tiny Tad," ask him to tell you the story of Tiny Tad as well as he can. In the meantime write as rapidly as you can just what the pupil says. Ask the pupil to tell a sentence at a time if he talks too rapidly. When he discontinues speaking, ask him if he remembers anything else. Following this, ask him the questions and record his answers.

5. If the pupil has been reading "The Grasshoppers" or "Ancient Ships," hand him the report blank to fill out. Ask him to write the story which he has read as well as he can. Impress upon him the fact that he should not look at the questions on the opposite side of the sheet until he has finished writing his story.

DIRECTIONS FOR SCORING THE RESULTS

Rate of silent reading—

1. Enter the number of seconds required by each pupil to read 100 words in the column under "Rate" on the record sheet. The time record for pupils who read "The Grasshoppers" and "Ancient Ships" was based on 200 words. Divide the time record for these pupils by 2 before entering the rate on the record sheet. Drop fractions.

2. Find the average number of seconds required by the pupils of a class to read 100 words.

3. Express this average in terms of the number of words read per second. To do this divide 100 by the average number of seconds required by the class to read 100 words.

Quality of silent reading—

1. Score the reproductions as follows: check from the pupil's reproduction all wrong statements, all irrelevant statements, and all repetitions. Count the remaining words. Find the percentage that these words are of the total number of words in the selection. Enter the result in the column under "Reproduction" on the record sheet.

2. Give a credit of 10 points to each question answered correctly. Enter the total grade for each pupil for questions answered correctly in the column under "Questions."

3. Average the reproduction grade and the grade received for correct answers to questions for the quality score. Drop fractions. Enter the quality score in the appropriate column on the record sheet.

4. Find the average quality score for the class by finding the sum of the individual quality scores and dividing by the number of pupils in the class.

CHAPTER IV

VALIDITY OF THE ORAL-READING TEST

It is the purpose of this chapter to give a description of the methods used in deriving the series of standardized paragraphs for the oral-reading test, to discuss the validity of the test, and to point out significant limitations.

The initial attempt to derive an oral-reading test resulted in the selection of a tentative series of paragraphs. This series passed through two successive modifications before the present test was derived. In certain respects the methods which were employed at the outset were retained unchanged throughout the study. In other respects the methods were materially changed as the study developed. The following description of the derivation of the test presents in detail the methods which were used and the results which were secured in each of the successive studies.

DESCRIPTIVE SUMMARY OF THE INITIAL STUDY¹

The purpose of this study was to derive a tentative scale for the measurement of certain phases of oral-reading ability. It seemed best to limit this initial investigation to the measurement of ability along certain very definite lines that are objective and easily measured. The time required to read a paragraph and the number of errors made in reading were adopted as the basis for measurement. An analysis of the errors made by pupils led to the following classification of errors:

1. Gross errors in pronunciation, i.e., mispronunciations which indicate clearly that the words are beyond the pupil's ability.
2. Minor errors in pronunciation, i.e., mispronunciation of one or two elements of a word.
3. Omission of words.
4. Substitution of one word for another.
5. Insertion of words not included in the text.

¹ *A Tentative Scale for the Measurement of Oral Reading Ability*, Master's Thesis, Teachers College, Columbia University, 1914.

Methods employed in selecting the paragraphs for the test.—As a first step in selecting the passages for the reading test ten sets of readers of recent date were studied. From the various readers for the different grades sixty representative paragraphs were chosen with the following points in mind: (1) that each paragraph contain about 50 words; (2) that each paragraph contain a somewhat complete thought-unit; (3) that the thought of the paragraphs be adapted to the interests of children. It was impossible to conform strictly to the last point mentioned in the case of the more difficult paragraphs. Furthermore, in a very large number of cases it was necessary to reconstruct the paragraphs in order to make them conform to the three standards mentioned above.

From the collection of sixty paragraphs sixteen were chosen, which in the opinion of the writer represented a series of paragraphs of various degrees of difficulty. These paragraphs were then numbered without regard to their order and submitted to twenty graduate students with these directions: "Please arrange the following paragraphs in the order of their difficulty for oral reading with emphasis particularly upon pronunciation. When you have completed the arrangement of the paragraphs, record the order on the accompanying blank by placing the number of the easiest slip opposite *First*, the number of the next easiest opposite *Second*, etc."

The rankings of the paragraphs by the individual judges appear in Table IX. The numbers in the vertical column to the left of the table are the numbers which were assigned to the specimen paragraphs. The numbers in the horizontal line at the top of the table are the numbers which were assigned to the various judges. The entries in the table are the rankings or order of difficulty of the various paragraphs as determined respectively by each judge, 1 representing the easiest; 16, the hardest. Before proceeding farther it should be stated that rankings by judges should not be given much weight in establishing a scale unless the judges are competent to offer expert opinion concerning the problem at hand and unless a large number of judgments are secured upon which to base conclusions. Since the relative difficulty of the paragraphs can be determined most accurately on the basis of data secured from

elementary-school pupils, the opinions of twenty graduate students are used in this study merely as a preliminary guide.

TABLE IX
DISTRIBUTION OF THE RANKINGS OF THE SPECIMEN PARAGRAPHS BY EACH OF THE JUDGES

Para- graph	Judges																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1...	4	3	3	3	4	4	4	5	5	6	4	12	7	2	2	16	6	7	4	3
2...	7	6	10	5	6	6	5	9	6	9	7	13	4	5	3	6	7	3	10	4
3...	5	4	8	4	5	5	3	6	3	5	9	16	2	4	6	5	4	4	3	6
4...	9	9	11	6	8	12	8	13	8	12	14	8	3	6	5	14	11	6	9	7
5...	2	1	2	2	2	2	2	2	2	4	3	6	3	4	10	1	1	1	1	1
6...	16	16	16	16	16	14	16	16	16	16	16	16	16	16	16	7	16	16	16	6
7...	12	10	9	12	11	9	12	3	9	14	8	9	5	9	14	3	8	13	5	9
8...	8	12	12	8	10	11	11	15	12	11	13	10	12	11	8	15	12	12	7	12
9...	6	7	4	11	3	10	6	14	11	4	2	14	10	8	10	8	3	5	6	5
10...	15	15	15	13	13	8	13	11	14	15	11	4	15	10	13	13	15	11	12	13
11...	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
12...	14	13	14	15	15	16	14	10	15	8	15	2	13	14	9	4	14	15	14	15
13...	11	14	13	14	14	15	15	7	13	13	12	7	8	15	15	11	13	14	15	14
14...	10	5	6	9	9	7	7	8	4	10	3	11	11	7	7	9	9	8	11	10
15...	13	11	5	10	12	3	9	5	13	3	6	5	9	12	11	1	10	10	13	8
16...	3	8	7	7	7	13	10	12	7	7	10	15	14	13	12	12	5	9	8	11

As an aid in determining the combined opinion of the twenty judges in regard to the rank of each paragraph, Table IX was converted into Table X, which shows the number of times each paragraph was given certain rankings by the judges. The numbers in the vertical column to the left of the table refer to the paragraphs. The numbers in the horizontal line at the top of the table refer to the rankings. The entries represent the number of times each paragraph was given certain rankings by the twenty judges.

To determine temporarily the position of each paragraph in the series, the opinion of the median judge was taken as a guide. Referring now to Table X, paragraph 1, and adding the integers in the line to the right, one must include four-sixths of the 6 in column 4 before reaching the median. Since the median for paragraph 1 falls under rank 4, paragraph 1 was assigned fourth place in the series. In a similar manner the median was found in the case of each of the other paragraphs and their positions were determined. It will be noted that in the case of paragraphs 4, 8, 9, 13, 14, 15, and 16 the

position of the paragraph in the series lies between two rankings rather than at a definite point. The median rank of each paragraph is indicated in the vertical column at the right of Table X.

TABLE X

NUMBER OF TIMES EACH PARAGRAPH WAS GIVEN CERTAIN RANKINGS BY THE JUDGES

Paragraph	Rankings																Median Rank
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1.	0	2	4	6	2	2	2	0	0	0	0	1	0	0	0	1	4
2.	0	0	2	2	3	5	3	0	2	2	0	0	1	0	0	0	6
3.	0	1	3	5	5	3	0	1	1	0	0	0	0	0	0	1	5
4.	0	0	1	0	1	3	1	4	3	0	2	2	1	2	0	0	Between 8 and 9
5.	5	9	2	2	0	1	0	0	0	1	0	0	0	0	0	0	2
6.	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	17	16
7.	0	0	2	0	2	0	0	2	6	1	1	3	1	2	0	0	9
8.	0	0	0	0	0	0	1	3	0	2	4	7	1	0	2	0	Between 11 and 12
9.	0	1	2	2	2	3	1	2	0	3	2	0	0	2	0	0	Between 6 and 7
10.	0	0	0	1	0	0	0	1	0	1	3	1	6	1	6	0	13
11.	14	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12.	0	1	0	1	0	0	0	1	1	1	0	0	2	6	6	1	14
13.	0	0	0	0	0	0	2	1	0	0	2	1	4	5	5	0	Between 13 and 14
14.	0	0	1	1	1	1	4	2	4	3	3	0	0	0	0	0	Between 8 and 9
15.	1	0	2	0	3	1	0	1	2	3	2	2	3	0	0	0	Between 9 and 10
16.	0	0	1	0	1	0	5	2	1	2	1	3	2	1	1	0	Between 9 and 10

After the relative position of the paragraphs in the series were determined in this general way, the equality of the steps of difference was next determined through a use of the principles involved in *The Equality of Equally Often Noted Differences* (Thorndike, 1913, p. 122). The method of procedure was as follows: Paragraph 11, Table X, which holds first place in the series, was compared with paragraph 5, which holds second place in the series, to determine how many judges marked 11 as harder than 5. Similar comparisons were made between the second and third paragraphs in the series, the third and fourth, etc. In the case of paragraph 9, which holds sixth place in the series, a comparison was made, not only with paragraph 2, which holds fifth place, but also with both paragraphs 4 and 14, each of which holds seventh place in the series. Other double comparisons were necessary, as will be noted in Table XI.

Table XI is easily interpreted. For our purpose it is essential to note that paragraph 9 is rated as harder than paragraph 4 by 7 judges and as harder than paragraph 14 by 8 judges. Since the

differences between 9 and 4, on the one hand, and between 9 and 14, on the other hand, are about equal, according to the opinion of the twenty judges, either paragraph 4 or paragraph 14 may be dropped. For our purposes 14 was dropped. Similarly, the differences between paragraphs 7 and 15 and between paragraphs 7 and 16 are about equal. Either paragraph 15 or paragraph 16 should have been dropped from the list. Through some oversight paragraph 7 was dropped instead. In all other cases the differences between the successive paragraphs are large enough to justify their

TABLE XI

STEPS OF DIFFERENCE BETWEEN THE SUCCESSIVE PARAGRAPHS OF THE SCALE

Number of judges rating 11 harder than				5	is	5;	vice versa, 15				
"	"	"	"	5	"	"	1	2	"	"	18
"	"	"	"	1	"	"	3	8	"	"	12
"	"	"	"	3	"	"	2	5	"	"	15
"	"	"	"	2	"	"	9	7	"	"	13
"	"	"	"	9	"	"	4	7	"	"	13
"	"	"	"	9	"	"	14	8	"	"	12
"	"	"	"	4	"	"	7	7	"	"	13
"	"	"	"	14	"	"	7	7	"	"	13
"	"	"	"	7	"	"	15	11	"	"	9
"	"	"	"	7	"	"	16	11	"	"	9
"	"	"	"	15	"	"	8	7	"	"	13
"	"	"	"	16	"	"	8	6	"	"	14
"	"	"	"	8	"	"	10	7	"	"	13
"	"	"	"	10	"	"	13	9	"	"	11
"	"	"	"	13	"	"	12	8	"	"	12
"	"	"	"	12	"	"	6	2	"	"	18

retention in the list. As a result of the study of the data of Tables IX, X, and XI, the final order of the paragraphs in the revised list was as follows: The intervening numbers inclosed in parentheses represent the steps of difference: 11-(15)-5-(18)-1-(12)-3-(15)-2-(13)-9-(13)-4-(22)-15-(0 or 1)-16-(14)-8-(13)-10-(11)-13-(12)-12-(18)-6.

Two additional steps were now taken in order to complete the scale. It will be noted that the difference between paragraphs 5 and 1 is quite distinct, since 18 of the 20 judges decided that paragraph 5 was easier than paragraph 1. The difference between

paragraphs 12 and 6 is similarly distinct. Because of the large "steps of difference" between these respective couplets it seemed best to select a paragraph intermediate in difficulty to fit in between the members of each couplet. With the help of a graduate student the needed paragraphs were chosen. This added two new paragraphs to the list, making sixteen in all. The large difference between paragraphs 4 and 15 was due to the error already mentioned. It was not considered in this revision of the list because the mistake was not discovered in time.

Before the test was printed it was given to forty pupils. An examination of the data suggested two changes. First, it seemed that the paragraph which had been inserted between paragraphs 5 and 1 was easier than paragraph 5, and also that there was not quite as distinct a difference between paragraphs 5 and 1 as the judges had thought. This suggested a reorganization of the first four paragraphs of the series into the following order: paragraph 11, the newly inserted paragraph, paragraph 5, paragraph 1. The data also suggested the fact that the scale did not include as difficult passages as would be necessary to test upper-grade pupils. To remedy this situation, four difficult paragraphs were added to the scale. The paragraphs were now numbered in the order of increasing difficulty and printed as they appear below.

1

It was time for winter to come. The little birds had all gone far away. They were afraid of the cold. There was no green grass in the fields, and there were no pretty flowers in the gardens. Many of the trees had dropped all their leaves. Cold winter with its snow and ice was coming soon.

2

Once there lived a king and queen in a large palace. But the king and queen were not happy. There were no little children in the house or garden. One day they found a poor little boy and girl at their door. They took them into the palace and made them their own. The king and queen were then happy.

3

Once a green little leaf was heard to sigh and cry, as leaves often do when a gentle wind blows. "What is the matter, Little Leaf?" said the twig. The little leaf replied, "The wind just told me that one day it would pull me off and throw me down to the ground to die. That is why I am so sad."

4

Once I went home from the city for a summer's rest. I took my gun for a stroll in the woods where I had shot many squirrels. I put my gun against a tree and lay down upon the leaves. Soon I was fast asleep, dreaming of a group of merry, laughing children running and playing about me on all sides.

5

One of the most interesting birds which ever lived in my bird-room was a blue jay named Jakie. He was full of business from morning till night, scarcely ever still. He had been stolen from a nest long before he could fly, and he was reared in a house long before he had been given to me as a pet.

6

Henry was a busy farmer. His farmhouse stood on a hillside above the seashore. Along the shore and up the hillside were the houses of his friendly neighbors. Around his house the ground was flat, like the top of a huge step in the hillside. All about him stretched his small, verdant rice fields.

7

It was a glad summer morning. Little birds teetered on the twigs of the trees. They opened their throats and sang as loud as they could. Flowers nodded to each other in the gardens and along the wayside. Butterflies went flitting about gayly, the morning air was fresh and sweet, and all was gladness.

8

I remained there nearly two hours, I dare say. Once I opened the yard gate and looked into the empty street. The sand, the seaweeds, and the flakes of foam were driving by, and I was obliged to call for assistance before I could shut the gate again and make it securely fast against the strong wind.

9

The part of farming enjoyed most by a boy is the making of maple sugar. It is better than blackberrying and almost as good as fishing. One reason he likes this work is that someone else does most of it. It is a sort of work in which he can appear to be very industrious, and yet do but little.

10

Rip would carry a fowling piece on his shoulder for hours together. He would trudge through the woods and swamps, up hill and down dale, to shoot a few squirrels or pigeons. He would never refuse to assist a neighbor in any way. Even the women of the village often employed him to run their little errands.

11

As far as the eye could reach the sea was of a deep blue color in every direction. The waves were running high, and were fresh and sparkling in the sunlight. In the midst lay an immense iceberg. Its cavities and valleys were thrown into deep shades. Its points and towers glittered brightly in the sun.

12

The sun pierced into my large windows. It was the opening of October, and the sky was of a dazzling blue. I looked out of my window and down the street. The white houses of the long, straight streets were almost painful to the eyes. The clear atmosphere allowed full play to the sun's brightness.

13

The success of Greeley's paper was immediate and great. It grew a little faster than the machinery for producing it could be provided. The success of the paper was due to the fact that the editor's original idea was carried out. He aimed to produce a paper which was morally helpful to the public.

14

It was one of those wonderful evenings such as are found only in this magnificent region. The sun had sunk behind the mountains, but it was still light. The twilight glow embraced a third of the sky, and against its brilliancy stood the dull white masses of the mountains in evident contrast.

15

The crown and glory of a useful life is character. It is the noblest possession of man, constituting a rank in itself, an estate in the general good-will, dignifying every station, and exalting every position in society. It exercises a greater power than wealth, and is a valuable means of securing honor.

16

George Washington was in every sense of the word a wise, good, and great man. But his temper was naturally irritable and high-toned. Through reflection and resolution he had obtained a firm and habitual ascendancy over it. If, however, it broke loose its bonds, he was most tremendous in his wrath.

17

He was six feet tall, and his body was well-proportioned. His complexion inclined to the florid; his eyes were blue and remarkably far apart. A profusion of hair covered the forehead. He was scrupulously neat in his appearance, and, although he habitually left his tent at an early hour, he was well dressed.

18

Responding to the impulse of habit, Josephus spoke and the others listened attentively, but in grim and contemptuous silence. He spoke for a long time, continuously, persistently, and ingratiatingly. Finally exhausted through lack of nourishment, he hesitated. As always happens in that contingency, he was lost.

19

The hypotheses concerning physical phenomena formulated by the early philosophers proved to be inconsistent and, in general, not universally applicable. Before relatively accurate principles could be established, physicists, mathematicians, and statisticians had to combine forces and work arduously.

20

“Read the following sentences correctly: Sophistry is fallacious reasoning. They resuscitated him. Verbiage is wordiness. Equanimity is evenness of mind. He has a pertinacious, obstinate disposition. There was subtlety and poignancy in his remarks. A hypocritical and pharisaical nature is usually cynical.”

To whom the test was given.—The test was given to 565 pupils from the third to the eighth grade inclusive. These pupils represented four schools, three in the city of New York and one in a small city in central Illinois. Two of the schools of New York are located in foreign districts of the city. The third New York school represents a more truly American population, economically independent. The Illinois school represents an American population of average economic rank. The pupils were about equally divided between native American and foreign-born children, and represent practically every economic level.

Scoring the results.—The method of securing the data and scoring the results was the same as that described in chap. iii of this report. One exception should be mentioned. In this initial study repetitions were not recorded as a type of error. In a later section of this chapter the validity of the standards for scoring will be discussed.

The records of all pupils were scored according to each of the four standards. Certain of the results are given in Table XII. The table contains the results for the sixth grade by each of the four standards, the aggregate results for the sixth grade by all standards, and the aggregate results for all grades by all the

TABLE XII

PERCENTAGES CORRECT AND P.E. EQUIVALENTS FOR EACH PARAGRAPH

PARAGRAPH	SIXTH GRADE, STANDARD I		SIXTH GRADE, STANDARD II		SIXTH GRADE, STANDARD III		SIXTH GRADE, STANDARD IV		SIXTH GRADE, ALL STANDARDS		ALL GRADES, ALL STANDARDS	
	No.	Percent-age	No.	Percent-age	No.	Percent-age	No.	Percent-age	No.	Percent-age	No.	Percent-age
1.....	216	100.0	214	99.1	205	94.9	176	81.5	811	93.9	2,044	90.4
2.....	216	100.0	212	98.1	203	94.0	172	79.6	803	92.9	2,014	84.7
3.....	213	98.6	206	95.4	187	86.6	139	64.4	745	86.2	1,764	78.1
4.....	214	99.1	208	96.3	185	85.6	155	71.8	762	88.2	1,728	76.5
5.....	212	98.1	200	92.6	185	85.6	132	61.1	729	84.4	1,513	66.9
6.....	207	95.8	189	87.5	167	77.3	131	60.6	693	80.2	1,443	64.1
7.....	212	98.1	185	85.6	150	69.4	101	46.8	678	78.5	1,347	59.6
8.....	207	95.8	188	88.0	167	77.3	147	68.0	701	81.1	1,353	59.6
9.....	201	93.1	182	82.4	161	74.5	127	58.8	677	78.4	1,260	55.8
10.....	199	92.1	178	82.4	150	69.4	112	51.9	639	74.0	1,198	53.6
11.....	196	90.7	183	84.7	166	76.9	122	56.5	670	77.5	1,211	53.6
12.....	188	87.0	174	80.6	151	69.9	112	51.9	635	73.5	1,139	50.4
13.....	186	86.1	174	80.6	145	67.1	120	55.6	617	71.4	1,077	47.7
14.....	186	86.1	154	71.3	128	59.3	83	38.4	551	63.8	945	41.8
15.....	167	77.3	139	59.7	98	45.4	57	26.4	444	52.2	733	32.4
16.....	152	70.4	107	49.5	75	34.7	35	16.2	451	42.7	590	26.1
17.....	163	75.5	119	55.1	70	32.4	17	7.9	369	42.7	565	25.0
18.....	126	58.3	68	31.5	23	10.6	7	3.2	224	25.9	330	14.6
19.....	38	17.6	8	3.7	4	1.9	1	0.5	51	5.9	80	3.5
20.....	6	2.8	0	0.0	0	0.0	0	0.0	6	0.7	13	.3
No. of cases.....	216		216		216		216		864		2,260	

standards. The entries in the first column under each of the first four sections of the table represent the total number of pupils in the sixth grade who were able to read the respective paragraphs successfully, and the entries in the second column in each case represent the percentage of successful readings. The entries in the first column under "Sixth Grade, All Standards" represent the sum of all the successes per paragraph for all standards. The entries in the first column under "All Grades, All Standards" represent the sum of the separate successes per paragraph for all grades and all standards.

Scaling the paragraphs.—The method used in scaling the paragraphs was the same as that followed by Buckingham (1913) in scaling the words of his spelling scale. For the purpose of this report a special study is made of the sixth grade, inasmuch as more

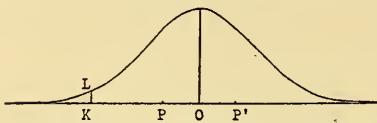


DIAGRAM IV.—"Normal surface of frequency" (after Buckingham).

pupils were tested in this grade than in any other. The relative difficulty of each of the paragraphs for the sixth grade upon the basis of the scoring by Standard I was determined as follows: Assuming that the distribution of the 216 sixth-grade pupils represents a normal-frequency distribution, a paragraph read by 100 per cent of the pupils would present no noticeable difficulty to that grade. The ability of all the pupils would be greater than the ability required to read it, and the entire area of the frequency surface would lie to the right of the position of the paragraphs. For a detailed discussion of the theory supporting this method see Thorndike's *Mental and Social Measurements*, chap. xiii. In Diagram IV, if OP represents probable error (or quartile deviation), paragraphs read correctly by all pupils tested would be located theoretically at an indefinite distance to the left of the point O , which we assume to be five or six times the distance OP . Table XII shows that the first two paragraphs had no difficulty for the sixth grade. Paragraph 3 was read successfully by 98.6 per cent of the pupils as scored by Standard I. This paragraph, according to our theory, would be located at a point K , since a vertical at this point cuts off

1.4 per cent of the area of the entire frequency surface. By means of tables prepared for this purpose (Buckingham, *Spelling Ability: Its Measurement and Distribution*, p. 35) we find K to be located at a distance from O equal to 3.26 times OP . In a similar manner we find that a paragraph read by 50 per cent of the pupils would be located at O , and one read by 0 per cent of the class would be located 5+ P.E. to the right of point O .

In Table XII the section headed "Sixth Grade, Standard I" gives the number and percentage of pupils reading each paragraph successfully, and also expresses the percentages in terms of P.E. according to the method described above. A negative sign precedes P.E. in the case of all paragraphs located to the left of point O . For illustration, -3.26 P.E. means that paragraph 3 is located 3.26 times P.E. to the left of O ; $+2.86$ P.E. means that paragraph 20 is located 2.86 times P.E. to the right of point O . In a similar way the location of each paragraph for Standards II, III, and IV was determined. The data of this table, together with the corresponding figures in Diagram V, afford a basis for calculating the relative difficulty of the various paragraphs as determined by each of the four standards of grading. The facts shown are (1) that, although there are slight variations, the relative difficulty of the paragraphs is remarkably similar, and (2) that the four standards of scoring increase quite regularly in severity from the first to the fourth inclusive.

Since these standards range in severity from very liberal scoring to very severe scoring, it seemed best at the outset to base conclusions upon the results of all the gradings rather than upon the results of any one. Hence the data for the four standards were averaged and the relative difficulty of each of the paragraphs determined upon that basis. The results are tabulated in Table XII and represented graphically in Diagram V. It is interesting to note that the order of difficulty as revealed by this distribution is slightly different, except in three cases, from the proposed order.

While the scaling of the paragraphs upon the basis of data from the sixth grade alone defines the relative difficulty of the paragraphs for the pupils of that grade, additional steps are necessary to secure the best distribution for all of the grades. To this end the data

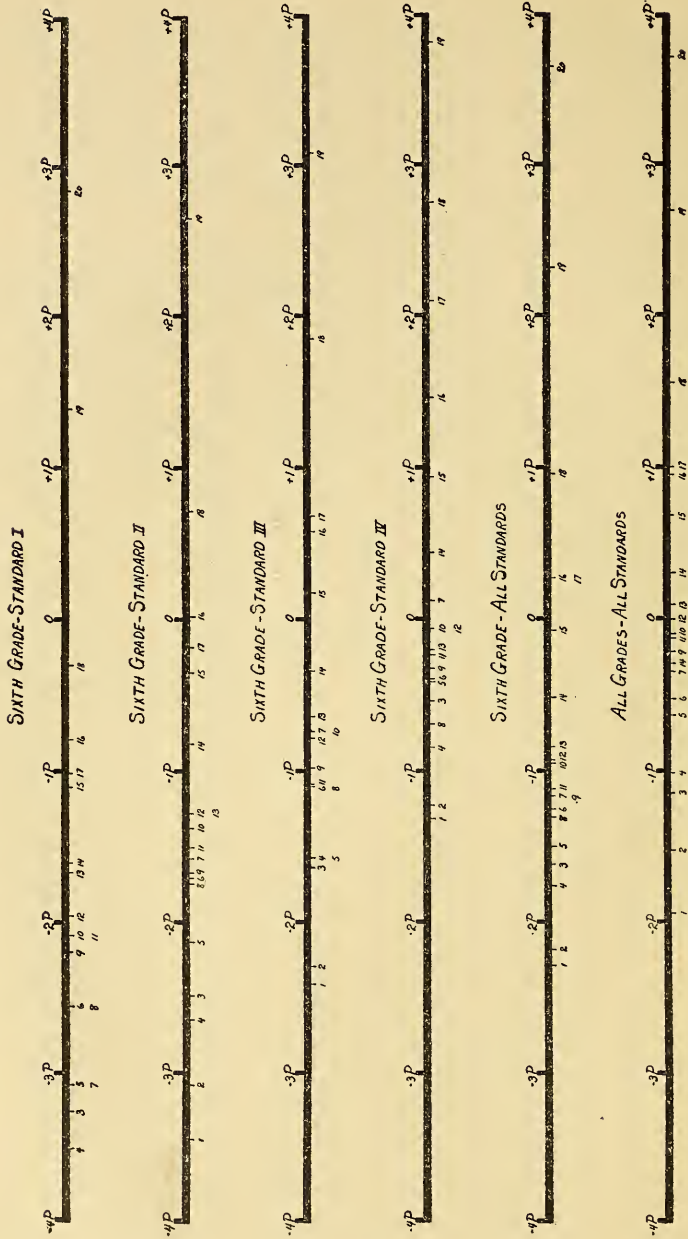


DIAGRAM V.—Steps of difference in difficulty between paragraphs

for all the grades were combined and the paragraphs scaled anew. The results are tabulated in Table XII and represented graphically in Diagram V. As compared with the results for the "Sixth Grade, All Standards," it is evident that the paragraphs at the lower end of the scale are much more clearly differentiated. We should expect this, since these paragraphs present relatively greater difficulty to the pupils of the lower grades than to those of the higher grades.

ORGANIZATION OF THE SECOND SERIES OF PARAGRAPHS

The results of the initial study showed that the paragraphs were by no means ideally distributed as to difficulty. Furthermore, a test composed of twenty paragraphs proved to be too long for practical use. Hence it was decided to reduce the number of paragraphs to ten or twelve. Accordingly, paragraphs 1, 2, 4, 5, 9, 14, 15, 17, 18, and 19 were chosen because they represented a series in which, with one or two exceptions, there were distinct and nearly equal steps of difference. The steps of difference between these paragraphs, were determined by calculating the intervals between the locations of the paragraphs from the data given in the right-hand column of Table XII. These steps of difference are represented by the following numbers in parentheses: 1-(42)-2-(50)-4-(37)-5-(43)-9-(53)-14-(37)-15-(32)-17-(56)-18-(113)-19. It is apparent that the step of difference in difficulty between paragraphs 18 and 19 was too large. In addition, the results of the study up to this point had revealed the fact that it would be necessary to include a paragraph in the series which was easier than any which had thus far been used. It was therefore decided to introduce a new paragraph at each of these points.

The method employed to secure paragraphs for these points was as follows: From a series of sixty paragraphs the writer chose several which seemed somewhat easier than paragraph 1 of the initial series and several which seemed equal in difficulty to one which would fit in between paragraphs 18 and 19. These paragraphs, together with a copy of the initial series of paragraphs, were then given to a graduate class in experimental education with the following directions: "Select from the paragraphs printed on sheet I two paragraphs for oral reading which seem as much easier

than paragraph 1 of the initial series as paragraph 1 is easier than paragraph 2. In addition, select two paragraphs from sheet II which seem in difficulty for oral reading to lie midway between paragraphs 18 and 19 on the printed scale." From the thirty reports submitted a selection was made for each point on the scale for which a paragraph was desired. The twelve paragraphs were arranged in the following order for the second series of tests: new paragraph-1-2-4-5-9-14-15-17-18-new paragraph-19.

The newly organized reading test was now given to about 2,000 pupils in 23 schools in Illinois. These schools included three country schools, two one-room village schools, four two-room village schools, six village schools of three or more rooms, three representative ward schools of a city of 40,000, pupils from four homes for friendless children in Chicago, and the Elementary School of the University of Chicago. The schools from the city of 40,000 included one school from the very best portion of the city, one school from a foreign industrial section, and one school for negroes. The tests were all given individually by the writer, assisted by his sister, Miss Lilian Gray.

After the pupils of these schools had been tested, the relative difficulty of the paragraphs was again determined by the method used in the initial study. The P.E. distribution of the paragraphs for "All Grades, All Standards" was as follows:

	PARAGRAPHS											
	New	1	2	4	5	9	14	15	17	18	New	19
P.E. . . .	0.24	0.4	0.46	0.22	0.06	0.32	0.67	1.00	1.30	1.74	2.5	3.2

It is evident from this distribution that the first two paragraphs of the series had not been well selected for the purpose. It was therefore decided to drop these from the series and to substitute easier paragraphs in their places.

ORGANIZATION AND STANDARDIZATION OF THE THIRD SERIES OF PARAGRAPHS

The method adopted in order to secure the simpler paragraphs was as follows: A series of very simple paragraphs was selected by

teachers in the Elementary School of the University of Chicago. From these the writer selected five, to which were added paragraphs 2 and 4 of the second series. This new series was given to 50 first- and second-grade pupils. From the results of these tests two paragraphs were chosen which were substituted for the two discarded paragraphs. The paragraphs of the series were now renumbered in order of difficulty from 1 to 12, and they were printed as they appear in chap. iii of this report. This series of paragraphs has been used in the various studies reported in chaps. vi and vii.

School population tested as basis for final distribution of paragraphs.—The data upon which the final distribution of the paragraphs was based were secured from tests given to 3,299 pupils. Of this number 1,106 pupils were from 23 schools of Illinois and 2,193 pupils were from 44 schools of Cleveland. The 23 schools of Illinois are described in some detail on p. 74, and the Cleveland schools are described on p. 119. The cosmopolitan character of the urban and rural districts tested makes it unlikely that results of a materially different character would have been obtained from more widely selected regions.

An important difference exists in the data used from the Illinois schools as compared with the data used from the Cleveland schools. As was pointed out on p. 74, it was determined after testing about 2,000 Illinois pupils that the first two paragraphs of the reading test were unsatisfactory. Two paragraphs were subsequently substituted in their places. This change in paragraphs rendered certain records secured in Illinois invalid for purposes of later comparison. Upon careful examination of individual records it was decided to drop from present consideration all first- and second-grade records, of which there was a very large number. This reduced the number of Illinois cases to 1,106. These data, together with the Cleveland records, were combined for the purpose of scaling the paragraphs. All of the pupils, 3,299 in number, read all of the paragraphs of the final series from 3 to 12 inclusive. The Cleveland pupils, 2,193 in number, read all of the paragraphs, including the first two. In grouping the data to determine the relative difficulty of the paragraphs, all the data were used in connection with the paragraphs from the third to the twelfth inclusive, while only

the Cleveland data were used to determine the relative difficulty of the first three paragraphs. The effect which this combination of data had upon the final results will be discussed in detail later.

Scoring the results.—It was pointed out in chap. iii that the scoring of results in arithmetic or spelling tests is a relatively simple problem, since one takes a perfect record as the standard for success. Reading, on the other hand, presents a far more difficult problem, for, should the standard of perfect accuracy be adopted, many of our best readers would fail on the simplest paragraphs. It therefore became necessary for the purposes of this study to adopt an arbitrary standard, or set of standards, which would put the dividing line between success and failure below the standard of perfect accuracy. Since up to this time no such standards had been devised, it was necessary to study certain facts in regard to the reading of pupils in order to determine appropriate standards.

The first fact is that when a pupil reads a series of paragraphs of equal length but of increasing difficulty, the time required to read each of the successive paragraphs increases, although no errors are made in the reading. The record of pupil No. 1 in Table VI, p. 38, illustrates this point. Hence the time required, as well as the number of errors, is a measure of the difficulty of a paragraph for grade pupils. In addition, a careful study of reading records shows that only the better readers will read a paragraph of 50 words in less than 20 seconds, while only the poorer portion of the class requires more than 40 seconds. The records in Table VI show for the cases tabulated the validity of the statement.

Again, only the better readers make less than two errors in reading the given paragraph, while only the poorer readers make as many as five or more errors. Hence it is evident that between the limits which are described above, a set of standards could be devised of varying degrees of severity. The following standards represent a possible series of increasing severity: Only those readings are checked as failures which require—

- (a) 40 or more seconds with five or more errors;
- (b) 30 or more seconds with four or more errors;
- (c) 25 or more seconds with three or more errors, or
- (d) 20 or more seconds with two or more errors.

An application of these standards to the records of pupils showed that the rapid, careless reader received an unfair advantage under the conditions outlined in *a*, *b*, *c*, and *d*. After considerable experimenting it was found that a large percentage of such cases could be penalized by the following additions to the conditions mentioned above: Those readings are checked as failures—

- (*a*) which require less than 40 seconds, but make seven or more errors;
- (*b*) which require less than 30 seconds, but make five or more errors;
- (*c*) which require less than 25 seconds, but make four or more errors, or
- (*d*) which require less than 20 seconds, but make three or more errors.

One additional provision was necessary to meet all the conditions. Wherever the final paragraphs of the scale were not read because the pupil had failed on previous paragraphs, such paragraphs were counted as failures. The four possible standards with all the provisions for each, arranged in the order of increasing severity, are as follows: A record is checked as a failure if—

- A. It is not read because of previous failures.
 - It is read in 40 or more seconds with five or more errors.
 - It is read in less than 40 seconds with seven or more errors.
- B. It is not read because of previous failures.
 - It is read in 30 or more seconds with four or more errors.
 - It is read in less than 30 seconds with five or more errors.
- C. It is not read because of previous failures.
 - It is read in 25 or more seconds with three or more errors.
 - It is read in less than 25 seconds with four or more errors.
- D. It is not read because of previous failures.
 - It is read in 20 or more seconds with two or more errors.
 - It is read in less than 20 seconds with three or more errors.

The preliminary use of these standards revealed three significant points. The first was that these standards increase in severity by practically equal steps, as shown in Diagram V, p. 72. This means that if the average of the four standards should be used, undue weight would not be given to the results secured by the use of any one standard. In the second place, it was found that if the scoring was done by one standard alone, two or three paragraphs of the series would appear to be of equal difficulty, while the results secured through the use of all four standards revealed a distinct gradation in the difficulty of the paragraphs. In this way it was

found that the use of all four standards gave a refinement to the results which the use of no single standard could secure. This was particularly true in cases where the groups of pupils involved were small. Because the groups involved in this study were relatively small in many cases and because a high degree of accuracy was essential, the average of the four scorings was adopted as the method for this study.

According to the method of scoring just described, the relative importance of the various types of errors is not considered. The question therefore arises concerning the validity of counting all errors as of equal importance. During the summer of 1914 a great deal of attention was given to this problem to determine the possibility of weighting the errors satisfactorily. The following set of directions was prepared and copies were given to 150 advanced students in education, most of whom were teachers and supervisors of experience. Each was requested to record, before returning the copy, his name, the position he last held or was holding at the present time, and his criticism concerning this method of weighting errors as a basis for determining the relative difficulty of paragraphs and the amount of achievement of pupils.

DIRECTIONS FOR GRADING READING ERRORS

1. The following paragraph was given to a large number of pupils of the elementary school, third to eighth grades inclusive, to read aloud as they would read in a regular reading recitation. Each pupil was heard alone.

The sun pierced into ^{the sky} my large windows. It was the opening of October, and the ^{clear} sky was of a dāzzling blue. I looked out of my window and down the street. The white houses of the long, st^{ra}ight street were almost painful to the eyes. The clear atmosphere allowed full play to the sun's brightness.

2. Errors of the following types were made and recorded:

- a) Gross errors.
 - 10 The word "atmosphere" was so poorly pronounced that it was evident that the pupil had no control over the word.
 - b) Minor errors within a word.
 - The word "pierced" was divided into two syllables, thus: "pier'ced."
 - The letter *a* in "dazzling" was pronounced long *a*.
 - The word "houses" was pronounced "house."
 - The word "almost" was pronounced "most."
 - The letter *o* in "allowed" was pronounced long *o*.

- c) Substitution of one word for another.
The word "my" was pronounced "many."
- d) Insertions.
The word "clear" was inserted between "the" and "sky."
- e) Omissions.
"Of" in the expression "of a dazzling blue" was omitted.
"And" in the expression "and down the street" was omitted.
- f) Repetitions.
Groups of words such as "to the sun's" were repeated by several of the readers.

3. I wish to make a scale for grading oral-reading ability of pupils. At this time I am considering merely the mechanical difficulties, such as are mentioned above. In order to determine the difficulty of each paragraph, I should know the relative importance of each of the types of errors mentioned. Suppose for convenience we say that a pupil who makes a gross error, that is, entirely mispronounces a word, should have 10 points subtracted from his grade. How much would you deduct for each of the other errors listed? Use integers either above or below ten according to the relative importance of the errors; do not use fractions if you can possibly avoid using them. Place the number indicating the relative importance of the errors to the left side of the sheet in a column with 10. Write a number for each error listed.

From the returns which were handed in 40 were chosen, the writers of which had had experience which qualified them to be experts in problems of reading. The list was composed largely of special reading teachers, primary and grade supervisors, normal-school training teachers, and superintendents who had given special attention to the problem of reading. The results tabulated from the 40 papers showed that whereas gross errors were given a grade of 10 points according to directions, the grade of greatest frequency for all other types of errors was 5 in each case. Similar results had been secured from 20 graduate students at Teachers College during the winter of 1913-14. Upon the basis of counting all gross errors as 10 points and each error of any other type as equal to 5, the relative difficulty of the paragraphs of series 3 was determined. A comparison of the results secured by this method with those given on p. 77 revealed the fact that there was very little difference between the results secured by the two methods. Because the method of scoring by weighting the errors was so laborious the adopted method was chosen as the more practical and usable.

The criticisms made by the teachers who weighted the errors show the hopelessness of adopting any single series of weightings which would satisfy the conditions for all grades and which would be satisfactory to all teachers. Fifteen out of the forty teachers stated that "the errors must be weighted for each grade, since age and training should be considered. For illustration, 'allowed' is a more serious error in the eighth grade than in the fourth." Other teachers said, "Before errors can be weighted the circumstances under which each is made must be known, such as carelessness, total inability, weakness in eye co-ordination, and lack of knowledge and training." Still others stated that "the value of each mechanical error should be determined upon the basis of the influence which it has upon the thought of the paragraph, and this will vary with the pupils and with the subject-matter which is read."

Summary of data used in scaling the paragraphs.—The records for all the pupils from Cleveland and Illinois were scored by the method previously described, and the tabulations were made in terms of the number of successful readings per paragraph as described in Table VII. Since the paragraphs of the scale increase in difficulty, it is natural to think of increasing numbers of failures as we advance from one paragraph to the next. For the purpose of clearness in this description of the final scaling of the paragraphs increasing difficulty will be expressed by increasing numbers of failures. The average number of failures for a given grade was found by subtracting the average number of successes for each paragraph from the number of pupils in a grade. If, in a grade of 20 pupils, there are 15 successes on a given paragraph, it is evident that the number of failures is 5. In this way the total number of failures per grade for each paragraph was found.

Table XIII contains a record of failures by grades for 3,299 pupils. The entries in Section A refer to the average number of failures for pupils of Cleveland for paragraphs 1, 2, and 3. The entries in Section B refer to the average number of failures for pupils of Cleveland and Illinois for paragraphs 3, 4, 5, etc.

In scaling paragraphs it is necessary to have the number of failures for each paragraph expressed on a percentage basis. Table XIV gives the percentages of failures by grades for each

paragraph and is derived by changing the entries in Table XIII to a percentage basis.

Method of scaling the paragraphs.—The method employed at this time in determining the steps of difference between successive paragraphs was based on the assumption that reading ability conforms in general to what is known as normal distribution. The same

TABLE XIII
NUMBER OF FAILURES BY GRADES

SECTION A				
Grade	No. of Cases	Paragraphs		
		1	2	3
I.....	330	171	248	289
II.....	329	46	115	147
III.....	332	18	71	91
IV.....	323	10	44	63
V.....	242	5	21	37
VI.....	216	4	13	25
VII.....	228	4	10	16
VIII.....	193	1	7	13

SECTION B

Grade	No. of Cases	Paragraphs									
		3	4	5	6	7	8	9	10	11	12
I.....	330	289	310	320	326	329	330	330	330	330	330
II.....	329	147	184	213	260	302	323	322	328	329	329
III.....	518	223	270	307	370	451	491	480	507	516	517
IV.....	574	177	228	275	345	409	481	487	524	569	572
V.....	436	81	108	129	189	242	312	321	367	422	431
VI.....	370	46	44	65	103	126	183	205	261	326	350
VII.....	384	31	38	53	80	103	143	170	235	317	346
VIII.....	358	23	25	38	53	58	90	115	186	241	280

assumption was made in the preceding attempts to find the relative difficulty of the paragraphs. The explanation which follows differs from the preceding, however, because a slightly different method of distributing the paragraphs was introduced. Furthermore, the description is given in more detail at this point for the sake of clearness. Diagram VI and the paragraphs which explain it are

adapted directly from Dr. L. P. Ayres's discussion of spelling ability and the normal distribution, *A Measuring Scale for Ability in Spelling*, pp. 25-30.

Let us suppose that the diagram represents the distribution of reading ability among a large number of third-grade children. The area inclosed between the curve and the base line represents all the

TABLE XIV
PERCENTAGE OF FAILURES BY GRADES

SECTION A											
Grade	Paragraphs										
	1	2	3								
I.....	51.82	75.15	87.58								
II.....	13.98	34.95	44.68								
III.....	5.42	21.39	27.41								
IV.....	3.10	13.62	19.50								
V.....	2.07	8.68	15.29								
VI.....	1.85	6.02	11.57								
VII.....	1.75	4.39	7.02								
VIII.....	.52	3.63	6.74								

SECTION B										
Grade	Paragraphs									
	3	4	5	6	7	8	9	10	11	12
I.....	87.58	93.94	96.97	98.79	99.70	100.00	100.00	100.00	100.00	100.00
II.....	44.68	55.93	64.74	79.03	91.79	98.18	97.87	99.70	100.00	100.00
III.....	43.05	52.12	59.27	71.43	87.07	94.79	92.66	97.88	99.61	99.81
IV.....	30.84	39.72	47.91	60.10	71.25	83.80	84.84	91.29	99.13	99.65
V.....	18.58	24.77	29.59	43.35	55.50	71.56	73.62	84.17	96.79	98.85
VI.....	12.43	11.89	17.57	27.84	34.05	49.46	55.41	70.54	88.11	94.59
VII.....	8.07	9.90	13.80	20.83	26.82	37.24	44.27	61.20	82.55	90.10
VIII.....	6.42	6.98	10.61	14.80	16.20	25.14	32.12	51.96	67.32	78.21

children ranged according to reading ability. At the extreme left the curve is very near the base, which indicates the small number of very poor readers. In the middle the curve is distant from the base, representing the large proportion of medium readers. At the right the curve is again near the base, representing the small proportion of excellent readers. The median line at point 100 represents average ability.

The dotted vertical lines at points 80 and 120 include between them 50 per cent of all the pupils. The dotted horizontal line between the median and the vertical line at 80 marks a distance known as "Probable Error" (P.E.), an important constant unit in calculations dealing with normal distributions. It is equal to half the distance on the horizontal line between 80 and 120. In this study this unit has been chosen as the basis of the measurements along the base line. If now we lay out on the base line to the right and left of the median distances equal to the P.E. distance, we shall have to the left of the median points marked at 80, 60, 40, 20, and 0, and to the right points marked at 120, 140, 160, 180, and 200.

In thus dividing the base into 10 equal parts, each part equal to the P.E. distance, and calling the extremes 0 and 200, we are taking liberties with the curve of normal distribution, for the base and the curve do not actually meet at these points. In theory the two lines could be indefinitely extended, always getting nearer together but never touching. Furthermore, about 99.96 per cent

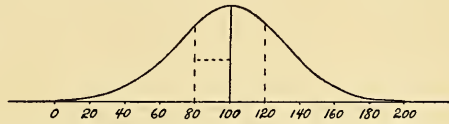


DIAGRAM VI.—"Surface of normal distribution"

of all cases lie to the right of the point indicated as 0 and some four-hundredths of 1 per cent of them lie to the left. For the purpose of the present study it has been considered sufficiently accurate to call the point 0 and assume that all cases lie to the right. A corresponding assumption is made with respect to the 200 point at the right end of the line.

On the basis of these assumptions, we find that the area of the curve beginning at the left and extending as far as the vertical line at the point 20 is 0.35 per cent of the total. Between this line and the one at 40 are 1.80 per cent of the cases, making a total to this point of 2.15 per cent. The points 60, 80, 100, 120, 140, 160, 180, and 200 include from the beginning 8.87 per cent, 25 per cent, 50 per cent, 75 per cent, 91.13 per cent, 97.85 per cent, 99.65 per cent, and 99.96 per cent, respectively, of all the cases. From the table of values of the normal probability integral presented by Buckingham, *Spelling Ability—Its Measurement and Distribution*,

p. 35, a table of values was derived which shows the percentage of cases lying to the left of a vertical line drawn at each one of the 200 points marked off on the base line of our normal curve. These values are presented in Table XV.

This table differs from Buckingham's in the following ways: Buckingham assumed that the total area of the surface of frequency is 10,000. The extremes of the surface of frequencies were taken as -6 P.E. and $+6$ P.E. The base line of the frequency curve was divided into 120 equal divisions on either side of the median. The number of cases was then calculated which lie between the median and a vertical erected at each one of the 120 equal divisions. Since the median was adopted as the basis for all calculations, all percentages had to be expressed in terms of percentages above or below 50 per cent before the desired point on the base line could be found.

Table XV assumes that the total area of the surface of frequency is 10,000. Minus 5 P.E. is taken as zero on the base line and the values are computed in 200 units to $+5$ P.E. This rearrangement of the table leads to great economy of time. Having given the percentage of a total number of cases, one can determine quickly from the table at what point along the base line a vertical line must be drawn to include between it and the zero point the given percentage of cases.

Now, if we imagine the normal curve of Diagram VI as representing 332 typical third-grade children (Table XIII), ranked, according to reading ability, with the poorest at the left and the rest in order of ability to the right, we can determine the relative positions of the paragraphs along a straight line. Now, 5.42 per cent of the third-grade pupils (Table XIV) failed on paragraph 1. By looking at Table XV we find that the nearest percentage to 5.42 given in the table is 5.65 per cent. The base-line point corresponding to this percentage is 53. This means that a vertical line erected on the base line at point 53 will have approximately 5.42 per cent of the cases of the normal distribution to the left of it. We therefore adopt point 53 as the location for paragraph 1. In a similar way it is found that the location of paragraphs 2 and 3 for the same group are at points 76 and 82. The location for each of the paragraphs for each of the grades is presented in Table XVI.

TABLE XV

VALUES OF THE NORMAL PROBABILITY INTEGRAL CORRESPONDING TO VALUES OF P.E.

(Total area of the surface of frequency taken as 10,000. Minus 5 P.E. taken as zero on the base line and the values computed in 200 units to +5 P.E.)

Units on Base Line	Percentage of Cases	Units on Base Line	Percentage of Cases	Units on Base Line	Percentage of Cases	Units on Base Line	Percentage of Cases
0.....	0.04	51.....	4.92	101.....	51.35	151.....	95.73
1.....	0.04	52.....	5.28	102.....	52.69	152.....	96.02
2.....	0.05	53.....	5.65	103.....	54.03	153.....	96.31
3.....	0.05	54.....	6.04	104.....	55.36	154.....	96.57
4.....	0.06	55.....	6.46	105.....	56.70	155.....	96.82
5.....	0.07	56.....	6.89	106.....	58.02	156.....	97.05
6.....	0.08	57.....	7.35	107.....	59.33	157.....	97.27
7.....	0.09	58.....	7.83	108.....	60.63	158.....	97.48
8.....	0.10	59.....	8.34	109.....	61.93	159.....	97.67
9.....	0.11	60.....	8.87	110.....	63.21	160.....	97.85
10.....	0.12	61.....	9.43	111.....	64.47	161.....	98.02
11.....	0.13	62.....	10.00	112.....	65.71	162.....	98.17
12.....	0.15	63.....	10.61	113.....	66.95	163.....	98.31
13.....	0.17	64.....	11.24	114.....	68.16	164.....	98.45
14.....	0.19	65.....	11.89	115.....	69.35	165.....	98.58
15.....	0.21	66.....	12.58	116.....	70.53	166.....	98.70
16.....	0.23	67.....	13.29	117.....	71.68	167.....	98.81
17.....	0.26	68.....	14.03	118.....	72.81	168.....	98.91
18.....	0.29	69.....	14.79	119.....	73.92	169.....	99.00
19.....	0.32	70.....	15.59	120.....	75.00	170.....	99.09
20.....	0.35	71.....	16.40	121.....	76.06	171.....	99.17
21.....	0.39	72.....	17.25	122.....	77.09	172.....	99.24
22.....	0.43	73.....	18.12	123.....	78.10	173.....	99.31
23.....	0.47	74.....	19.03	124.....	79.08	174.....	99.37
24.....	0.52	75.....	19.96	125.....	80.04	175.....	99.43
25.....	0.57	76.....	20.92	126.....	80.97	176.....	99.48
26.....	0.63	77.....	21.90	127.....	81.88	177.....	99.53
27.....	0.69	78.....	22.91	128.....	82.75	178.....	99.57
28.....	0.76	79.....	23.94	129.....	83.60	179.....	99.61
29.....	0.83	80.....	25.00	130.....	84.41	180.....	99.65
30.....	0.91	81.....	26.08	131.....	85.21	181.....	99.68
31.....	1.00	82.....	27.19	132.....	85.97	182.....	99.71
32.....	1.09	83.....	28.32	133.....	86.71	183.....	99.74
33.....	1.19	84.....	29.47	134.....	87.42	184.....	99.77
34.....	1.30	85.....	30.65	135.....	88.11	185.....	99.79
35.....	1.42	86.....	31.84	136.....	88.76	186.....	99.81
36.....	1.55	87.....	33.05	137.....	89.39	187.....	99.83
37.....	1.69	88.....	34.29	138.....	90.00	188.....	99.85
38.....	1.83	89.....	35.53	139.....	90.57	189.....	99.87
39.....	1.98	90.....	36.79	140.....	91.13	190.....	99.88
40.....	2.15	91.....	38.07	141.....	91.66	191.....	99.89
41.....	2.33	92.....	39.37	142.....	92.17	192.....	99.90
42.....	2.52	93.....	40.67	143.....	92.65	193.....	99.91
43.....	2.73	94.....	41.98	144.....	93.11	194.....	99.92
44.....	2.95	95.....	43.30	145.....	93.54	195.....	99.93
45.....	3.18	96.....	44.64	146.....	93.96	196.....	99.94
46.....	3.43	97.....	45.97	147.....	94.35	197.....	99.95
47.....	3.69	98.....	47.31	148.....	94.72	198.....	99.95
48.....	3.98	99.....	48.65	149.....	95.08	199.....	99.96
49.....	4.27	100.....	50.00	150.....	95.41	200.....	99.96
50.....	4.59						

Diagram VII presents the facts of Table XVI in graphical form. The diagram consists of eight horizontal lines, each 200 units in length, which may be thought of as the base lines of the probability-curves for the eight grades. The circles on the horizontal line for each grade represent the locations of paragraphs 1, 2, 3, 5, 6, 7, 8, 10, 11, and 12 in order. The locations of paragraphs 4 and 9

TALBE XVI
LOCATION OF EACH PARAGRAPH OF THE SCALE
FOR EACH GRADE

SECTION A										
Grade	Paragraphs									
	1	2	3							
I.....	101	120	134							
II.....	68	89	96							
III.....	52	76	82							
IV.....	45	67	75							
V.....	40	60	70							
VI.....	38	54	65							
VII.....	37	49	56							
VIII.....	24	47	56							

SECTION B										
Grade	Paragraphs									
	3	4	5	6	7	8	9	10	11	12
I.....	134	146	156	167	182	200	200	200	200	200
II.....	96	104	111	124	141	162	160	182	200	200
III.....	95	102	107	117	134	148	143	160	179	186
IV.....	85	92	98	108	117	129	131	140	170	180
V.....	73	80	84	95	104	117	119	130	155	167
VI.....	66	65	72	83	88	100	104	116	135	148
VII.....	58	62	68	76	82	90	96	108	128	138
VIII.....	55	56	63	69	71	80	86	101	113	123

are omitted from the diagram because these paragraphs overlap the locations of paragraphs 3 and 8, respectively, as shown in Table XVI. The dotted lines trace the locations of the various paragraphs from grade to grade. Table XVI shows that paragraph 3 was not located at exactly the same point on the base line in all cases for Sections A and B. This was due to the fact that

the percentage failing on paragraph 3 in these cases differed somewhat. This difference in location is shown in the diagram by the shaded portion.

The table presents in an interesting way the fact that the successive grades represent increasingly higher levels of attainment. This is shown by the tendency of the dotted lines to shift to the left from grade to grade. This tendency is particularly well represented in the case of paragraph 2. For this paragraph the progress is quite marked in the lower grades and less marked in the upper

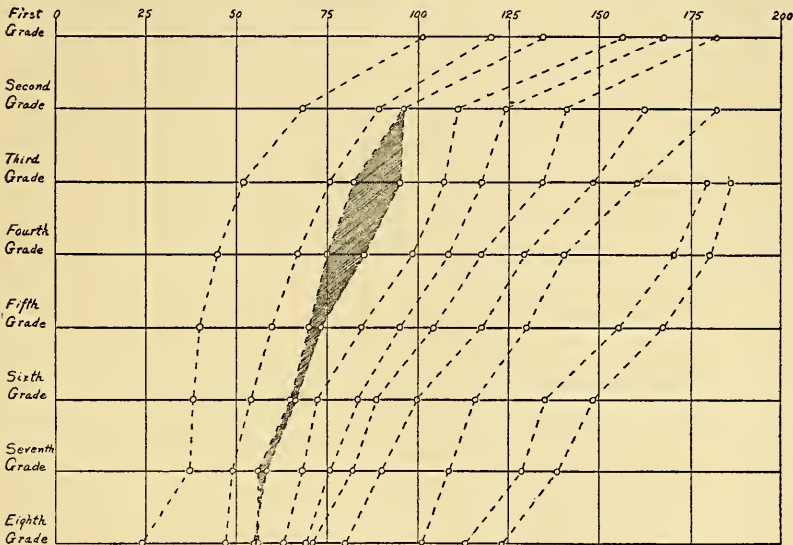


DIAGRAM VII.—Location of the paragraphs of the scale on the base line of the probability-curve for each grade.

grades, the shift from grade to grade forming a very smooth curve. It would be in harmony with natural expectation for all the curves to be equally regular. Although the curves for the various paragraphs do follow in general the curve for paragraph 2, there are some puzzling exceptions. A number of the irregularities in the third grade and some of the irregularities in the more advanced grades can be explained by the presence of the shaded section of the diagram caused by combining the data from Cleveland and Illinois. The unusual location of paragraph 1 for the eighth grade

may be explained as follows: Less than 1 per cent of the pupils in the eighth grade failed on paragraph 1. This means that the location of the paragraph is on the base line near one end of the normal curve. Table XV shows that small differences in percentages make for large differences in location at the extremes of the normal curve. Since this is true, it is possible for the location of a paragraph to be unduly exaggerated in one direction or the other near the extremes of the curve. On the other hand, it is hard to explain why the location for paragraph 1, Grade IV, is not in line with the location of the same paragraph for other grades. Similarly, it is hard to explain why the curves for paragraphs 11 and 12 should be less regular than the curve for paragraph 10. It is particularly difficult to explain why the step of difference between paragraphs 10 and 11 should be more marked in the fourth grade than it is in the fifth and sixth grades. A careful survey of the original data on this point fails to reveal a satisfactory answer. It is hoped that additional data will eliminate some of the irregularities which exist at present in the curves.

The exact determination of the achievement in oral reading of a given group of pupils might demand that the exact steps of difference in difficulty between the various paragraphs and also that the shifts from grade to grade be used as they are represented in Diagram VII. Practical considerations demand, however, that some measuring scale be adopted, if possible, in which there are uniform steps of difference, and in which shifts from grade to grade are the same for all the paragraphs. In order to adopt such a measuring scale, the average steps of difference for all the grades between the successive paragraphs and the average shift of all the paragraphs from one grade to the next were found. The shaded portion of Diagram VII complicated our problem. The following method of calculation was adopted because it introduced the least error: In determining the steps of difference between paragraphs 2 and 3 and between paragraphs 3 and 5 the locations of paragraph 3, as determined by Group A and B, respectively, were used. In determining the shift from grade to grade, the midpoint between the two locations of paragraph 3 were used in the cases of Grades III-VIII, inclusive.

Finding the steps of difference in difficulty between paragraphs.— Thus far we have found the location of the paragraphs of the scale upon the base line of the normal frequency curve according to the percentage of pupils failing on each paragraph. The steps of difference in difficulty between successive paragraphs can now be determined by computing the number of points along the base line from one paragraph to the next. Table XVII presents these steps of

TABLE XVII

STEPS OF DIFFERENCE FROM ONE PARAGRAPH TO THE NEXT FOR EACH GRADE

Grade	Paragraphs								
	1-2	2-3	3-5	5-6	6-7	7-8	8-10	10-11	11-12
I.....	19	14	22	11	15	.....	.....	.....	.....
II.....	21	7	15	13	17	21	20	.....	.....
III.....	24	6	12	10	17	14	12	19	7
IV.....	22	8	13	10	9	12	11	30	10
V.....	20	10	11	11	9	13	13	25	12
VI.....	16	11	6	11	5	12	16	19	13
VII.....	12	7	10	8	6	8	18	20	10
VIII.....	23	9	8	6	2	9	21	12	10

difference for each grade. Paragraphs 4 and 9 are omitted from this table because they overlap the location of adjacent paragraphs, as previously explained. Hence the entire steps from paragraphs 3 to 5 and from paragraphs 8 to 10 are entered in the table. The table reads: For the first grade the step of difference between paragraphs 1 and 2 is equal to 19 points; between paragraphs 2 and 3, equal to 14 points, etc.

Average steps of difference in difficulty.—The steps of difference between any two paragraphs vary somewhat from grade to grade. For convenience in measuring oral-reading achievement it is desirable to adopt common steps of difference for all the grades. After a careful study of the average and median steps of difference for all the grades had been made, steps of difference were arbitrarily chosen as presented in Table XVIII. While these steps do slight violence to the facts in special cases, the total number of steps remains the same. It will be very clear later that steps of difference between paragraphs in tens or multiples of ten add greatly to

convenience in the use of the scale when determining the oral-reading achievement of an individual or group.

TABLE XVIII
STEPS OF DIFFERENCE IN DIFFICULTY BETWEEN THE
PARAGRAPHS OF THE SCALE

Step	Average to Nearest Whole Number	Median to Nearest Whole Number	Step Arbitrarily Adopted
1- 2.....	20	21	20
2- 3.....	9	9	10
3- 5.....	12	12	10
5- 6.....	10	11	10
6- 7.....	10	9	10
7- 8.....	13	12	10
8-10.....	16	16	20
10-11.....	21	20	20
11-12.....	10	10	10
Total.....	121	120	120

Improvement from grade to grade.—Since the same paragraphs were used in testing the pupils of all grades, it was possible to compute the amount of improvement in reading from grade to grade. The method of finding the shift from grade to grade was as follows: The integers representing the location of each of the paragraphs (Table XVI) were added together for each grade. The increase in

TABLE XIX
AVERAGE SHIFT OF THE SCALE IN DIFFICULTY FROM
GRADE TO GRADE

Grades	Average Shift	Shift Arbitrarily Adopted
I-II.....	38	40
II-III.....	12	10
III-IV.....	11	10
IV-V.....	11	10
V-VI.....	13	10
VI-VII.....	7	10
VII-VIII.....	9	10

these sums from one grade to the next represented the total shift for all the paragraphs between the two grades. To find the average shift per paragraph this total increase was divided by the number of paragraphs. Table XIX presents the average shift per paragraph between each grade and the shifts finally adopted.

Steps of difference and shifts from grade to grade checked.— After the steps of difference in difficulty between the paragraphs and the shifts from grade to grade for the 3,299 Cleveland-Illinois pupils had been determined, 701 additional tests were given in Missoula, Montana, and at the Elementary School of the University of

TABLE XX
STEPS OF DIFFERENCE IN DIFFICULTY BETWEEN THE
PARAGRAPHS OF THE SCALE

Step	Average to Nearest Whole Number— 3,299 Pupils	Average to Nearest Whole Number— 4,000 Pupils	Adopted Steps
1- 2	20	19	20
2- 3	9	9	10
3- 5	12	12	10
5- 6	10	9	10
6- 7	10	10	10
7- 8	13	13	10
8-10	16	17	20
10-11	21	19	20
11-12	10	12	10
Total	121	120	120

Chicago. When these records were combined with the Cleveland-Illinois records, the total number of records equaled 4,000. Upon the basis of 4,000 pupils the steps of difference between the paragraphs were found to be as shown in Table XX.

TABLE XXI
AVERAGE SHIFT FROM GRADE TO GRADE

Grade	Average Shift— 3,299 Pupils	Average Shift— 4,000 Pupils	Shift Adopted
I-II	38	38	40
II-III	12	15	10
III-IV	11	13	10
IV-V	11	12	10
V-VI	13	11	10
VI-VII	7	6	10
VII-VIII	9	8	10

The shifts from grade to grade were found to be as shown in Table XXI.

The tables show that the addition of the 701 new records made but very little difference in the steps of difference and in the shifts from grade to grade. The differences indicated in the tables are in most cases larger than the real differences, since the averages entered in the tables are in terms of the nearest whole number. This is particularly true in the case of the steps of difference.

DESCRIPTION OF THE MEASURING SCALE FOR ORAL READING

Upon the basis of the steps of difference and the shifts from grade to grade just described a measuring scale for oral reading was devised and is presented in Table XXII. The numbers in the horizontal row

TABLE XXII
MEASURING SCALE FOR ORAL READING

Grade	3 to 7	8 to 12	13 to 17	18 to 22	23 to 27	28 to 32	33 to 37	38 to 42	43 to 47	48 to 52	53 to 57	58 to 62	63 to 67	68 to 72	73 to 77	78 to 82	83 to 87	88 to 92	93 to 97
I.....	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
II.....							1	2	3	5	6	7	8		10	11	12		
III.....						1	2	3	5	6	7	8		10	11	12			
IV.....				1	2	3	5	6	7	8		10	11	12					
V.....			1	2	3	5	6	7	8		10	11	12						
VI.....		1	2	3	5	6	7	8		10	11	12							
VII.....	1	2	3	5	6	7	8		10	11	12								
VIII.....	1	2	3	5	6	7	8	10	11	12									

above the table which increase by 5's to 100 represent the central points of 19 of the 20 divisions into which a 100-unit scale has been divided. The pair of figures above each number represents the limits of the divisions. Thus, the division indicated by 5 has 3 and 7 for its limits. The entries in the table represent the paragraphs of the scale. Since this scale is constructed upon a 100-unit rather than a 200-unit base, the paragraphs are separated by distances comparable to one-half the adopted steps of difference presented in Table XVIII, and the shifts from grade to grade are comparable to one-half the adopted shifts presented in Table XIX. Thus, paragraphs 1 and 2, 8 and 10, and 10 and 11 are separated by 10 points on the scale, and all other paragraphs are separated from those adjacent to them by five points on the scale. The shift between the first and second grade is 20 points, and it is 5 points

in each case between all other grades. As presented in the table, the measuring scale may be read as follows: Success by first-grade pupils on paragraph 1 is equivalent to an achievement of 55 points; success on paragraph 2 is equivalent to an achievement of 65 points, etc. Success on paragraph 1 by the third, fourth, fifth, sixth, seventh, and eighth grades is equivalent to 35, 30, 25, 20, 15, 10, and 5 points, respectively. Success on other paragraphs for the various grades may be read in a similar way.

The location of paragraph 1 in Table XXII was determined as follows: Since 51.82 per cent of the first-grade pupils failed on paragraph 1, it was apparent that it presented from 50 to 55 per cent difficulty for first-grade pupils and hence should be located at point 50 or 55 on the scale. By reducing the locations of the paragraphs given in Table XVI to a 100-unit basis and applying them to various assumed locations of paragraph 1, such as 50, 55, etc., it was found that the location of paragraph 1 at point 55 did less violence to the facts in Table XVI than any other location. According to this test, 34 cases out of 74 fell within the limits of the divisions indicated on the measuring scale; 32 were slightly above and 8 were slightly below.

VALIDITY OF THE ADOPTED VALUES IN THE MEASURING SCALE FOR ORAL READING

According to the method described on p. 44, the total scores were determined by using the adopted values for the successful reading of the paragraphs. In order to determine the extent to which a given score calculated upon the basis of the adopted values differs from the score calculated upon the basis of the real values, the scores of 2,193 Cleveland pupils were determined by both methods, and they are shown by grades in Table XXIII.

The average difference between the two methods is 1.5 points, which is surprisingly small in view of the large number of adjustments which have been made in the scale. It is evident from the table that very little violence will be done in scoring large groups on the basis of the adopted values.

To determine the influence which the methods of grading have upon the relative ranks of schools, the class scores were determined

by both methods for 10 second-grade classes chosen at random, and they are presented in Table XXIV.

TABLE XXIII
INFLUENCE OF METHODS OF SCORING ON TOTAL SCORE

	GRADES							
	I	II	III	IV	V	VI	VII	VIII
Score by adopted values.....	30.7	42.49	45.85	47.22	47.89	49.16	47.23	48.28
Score by real values.....	28.3	42.09	45.44	46.00	46.96	47.00	46.30	44.40
Difference....	2.4	0.40	0.41	1.22	0.93	2.16	0.93	3.88

The table shows that for the cases considered there is no change in the relative ranks of the second-grade classes through the use of the two methods of scoring. It is possible that cases might occur in which the relative position of a class would be changed slightly by the method of grading. It is clear, however, that the

TABLE XXIV
INFLUENCE OF METHODS OF SCORING ON RELATIVE RANK

	Classes									
	I	2	3	4	5	6	7	8	9	10
Score by adopted values	35.00	39.00	40.90	41.10	44.40	44.65	44.65	48.75	50.55	55.05
Score by real values...	34.80	39.40	41.30	41.40	43.30	45.10	45.80	47.00	51.40	55.50

changes would be infrequent and of no great consequence. Because the total scores for large groups are so nearly the same by both methods of grading and because the adopted values result in very few, if any, changes in the relative ranks of schools, there is strong evidence that the adopted scale measures with a high degree of accuracy.

Method of scoring pupils who fail on paragraph 1.—According to the method of determining achievement scores, those pupils who fail on paragraph 1 are given no credit. This in a way assumes that

zero reading ability lies just below the reading ability required to read paragraph 1 successfully. We know that such an assumption is not correct, because many pupils who just fail according to our easiest standard would succeed in case the standard were one step more liberal. It is evident, therefore, that the adopted method of scoring will penalize the lower grades more heavily than it will the upper grades, since there are relatively more pupils in the lower grades who fail on paragraph 1 than there are in the upper grades. Theoretically the average score for each grade should be about 48. The extent to which the lower grades have been penalized is shown in the average scores for Cleveland which are recorded in Table XXIII.

In order to determine the influence of giving to each pupil failing on paragraph 1 one-half the credit given to a pupil of the same grade who reads paragraph 1 successfully, the following method was employed: In the first grade all pupils failing on paragraph 1 were given a credit of $27\frac{1}{2}$ points, in the second grade $17\frac{1}{2}$ points, in the third grade 15 points, etc. The scores for all the grades in Cleveland were worked out on this basis and are compared in Table XXV

TABLE XXV

INFLUENCE OF GIVING ONE-HALF CREDIT TO PUPILS FAILING ON PARAGRAPH 1

	GRADE							
	I	II	III	IV	V	VI	VII	VIII
Adopted method	30.73	42.49	45.85	47.22	47.89	49.16	47.23	48.28
One-half credit..	43.45	44.96	46.88	47.87	48.09	49.33	47.30	48.29

with the scores determined by the adopted method. It is evident from the figures in the table that a credit somewhat above one-half the adopted credit given for the successful reading of paragraph 1 would be necessary in order to bring the score for each grade up to the theoretical level of 48. Since no single amount of credit which could be given to all pupils failing on paragraph 1 would truly represent the achievement of each pupil, the question arises as to the validity of accepting the zero basis as the most practical one for grading those who fail. If such a method of grading does not

change the relative ranks of schools, we shall assume that for practical purposes the adopted method is sufficiently accurate. Table XXVI gives the relative position of the ten lowest first grades

TABLE XXVI
INFLUENCE OF METHODS OF SCORING ON RELATIVE RANKS OF SCHOOLS

TEN LOWEST			TEN HIGHEST		
School	Adopted Method	One-Half	School	Adopted Method	One-Half
Eagle.....	5.90	28.20	Kinsman.....	37.65	48.35
Stanard.....	8.25	29.80	Denison.....	40.00	48.70
Fullerton.....	14.45	33.25	Hough.....	40.00	49.00
Case.....	14.80	33.55	Addison.....	41.95	50.85
Tremont.....	15.55	34.30	Detroit.....	44.30	53.20
Quincy.....	16.40	34.45	*Waverley.....	46.40	52.65
St. Clair.....	18.40	35.35	Willard.....	47.50	53.75
Mt. Pleasant.....	20.00	36.05	Orchard.....	48.55	55.10
Kentucky.....	20.60	36.25	Hodge.....	49.80	56.95
Sterling.....	21.60	36.80	*North Doan.....	52.30	55.85

* Refers to displacements in ranks of schools.

of Cleveland and the ten highest first grades when scored by the adopted method and when scored by the method which gives one-half credit to all those who fail on paragraph 1.

A comparison of the results secured by the two methods of grading reveals but two displacements in the relative ranks of the schools. In the 24 first-grade groups of Cleveland which are not reported in this table, the total scores of which are separated by very small differences, there are only seven displacements. Upon the basis of these figures it seems fair to assume that very little injustice will be done to any one school as a result of using a method of grading which gives a zero score to all those failing on the first paragraph.

LIMITATIONS OF THE SCALE

From an objective point of view the scale measures the rate and accuracy with which a pupil recognizes words and sentences at sight. The quality of the reading is not measured directly. It has been pointed out, however, that there is general correlation between the achievement of a pupil as measured by this scale and his general reading efficiency as measured by the classroom teacher.

Inasmuch as each pupil must be tested individually, away from the other members of his class, this reading scale has serious limitations as compared with tests which can be given to large numbers of pupils at the same time. When it is considered, however, that the teacher or supervisor is brought into very close contact with the successes and failures of each pupil and can study each individually, this administrative limitation proves to be a very great advantage because of the increased insight into problems of reading which the method affords.

It has been pointed out in the foregoing discussion of the derivation and validity of the oral-reading test that the average steps of difference between the paragraphs are not equal, and that the adopted values for scoring are at slight variance with the real values. In order to correct in part these limitations in the accuracy of the test, the following changes have been made: A new paragraph has been inserted between paragraphs 1 and 2. The word "beautiful" has been inserted in paragraph 3 to make it slightly more difficult. The word "constitutes" in paragraph 8 has been changed to the word "forms" to make the paragraph slightly easier. The word "approximately" has been inserted in paragraph 9 to make it slightly more difficult, and the paragraph has been restored to its original place in the test. In its revised form (see p. 46) the oral-reading test has been given to 4,066 pupils in Grand Rapids. The results show that the modifications listed above have improved the accuracy of the scale. There is still need for other changes. By making slight revisions from time to time in the paragraphs of the test it is hoped to derive a scale eventually which will increase by exactly equal steps of difference in difficulty from the easiest paragraph to the most difficult.

Inasmuch as only one series of paragraphs has been derived by this study, the criticism may be offered that the test can be used only once in a given school. After having given the tests repeatedly to the same group of students for two years at intervals of four months, the writer believes that the test can be used effectively a number of times if an interval of three or four months occurs between each test. This is particularly true in the lower grades, where natural growth during a period of four months is

sufficiently marked to enable a pupil to read paragraphs successfully which presented difficulties during the preceding test. However, in order to provide a greater variety of selections, the writer is at work at present upon a series of fifty paragraphs whose difficulty will be determined in terms of the difficulty of the paragraphs of the standard scale. With such a list at his disposal a superintendent could vary the test from time to time, thus removing the above-mentioned limitation.

The method of scoring does not penalize the slow reader of the first grade sufficiently. For illustration, the pupil who reads the first paragraph in 40 seconds with one error receives the same score as the pupil who reads it in 20 seconds with one error. Evidently the second pupil mentioned possesses superior reading ability. In order to remedy this defect, it will be necessary to revise the method of scoring the records of first-grade pupils.

Some of the better readers in the upper grades read all of the paragraphs of the oral-reading test with few or no errors. In such cases the scores cannot be considered as exact measures of oral-reading ability.

CHAPTER V

VALIDITY OF THE SILENT-READING TESTS AND STANDARDS

Three closely related problems will be discussed in this chapter: (1) the preliminary study of silent reading which was made to determine the answers to certain problems relative to silent-reading tests; (2) the critical evaluation of the methods of testing which were adopted for this study; (3) the validity of the standards of achievement for speed and quality of silent reading for the various grades.

THE PRELIMINARY STUDY OF SILENT READING

One of the important purposes of this preliminary study was to determine the advisability of using a series of three selections of increasing difficulty for a silent-reading test, the easiest of which should be adapted to the interests and reading capacities of second- and third-grade pupils, the next selection adapted to fourth-, fifth-, and sixth-grade pupils, and the hardest selection adapted to seventh- and eighth-grade pupils.

Accordingly, a number of selections were chosen for each of these three groups. Each selection was about 600 words in length. Selections were chosen in each case which, according to the judgment of the writer, were adapted to the interests and reading capacity of the average pupil in the group for which the choice was made. These selections were then read by a number of pupils in each grade. The pupils were asked to indicate the selections which they liked best. Almost without exception second- and third-grade pupils chose selections from the easiest group; fourth-, fifth-, and sixth-grade pupils chose selections from the group which was second in difficulty; and more often than not pupils in the seventh and eighth grades chose one of the more difficult selections. Of the selections which had been read by the pupils the three which were most frequently named in each group were chosen as the basis for further study. Of these selections it was desirable to

select that one from each group which would help to form a series increasing in difficulty by clearly defined steps of difference and which was best adapted to the reading capacity of the group for which it was intended.

Each of the nine selections was carefully mimeographed on sheets of paper sixteen inches long. A set of ten questions was prepared for each selection. These questions were based on points of the subject-matter which were distributed at almost equal intervals throughout the first two-thirds of each selection. These selections and questions were then sent to superintendents and principals of eight cities in the United States and Canada. In some cases only the three easiest selections were sent, with the request that each of the pupils of the second, third, and fourth grades read all three selections. In certain cases the selections which were second in difficulty were sent, and in other cases the hardest selections were sent. It was hoped that in this way the relative difficulty of the three selections of each group could be measured. In order to make further comparison possible, one selection from each of the three groups was sent to some schools, with the request that the second, third, and fourth grades read the easiest selection, the fourth, fifth, and sixth grades read the selection second in difficulty, and the sixth, seventh, and eighth grades read the most difficult selection. The directions for giving the tests were as follows:

DIRECTIONS TO TEACHERS

- a) Each pupil should be provided with a pencil.
- b) Pass both the reading sheets and the question sheets at the beginning. Each sheet should be placed on the desk face down and kept so until the pupils receive further directions.
- c) When the material has been distributed, the following directions should be given to the pupils:

"The long sheets of paper on your desks have some paragraphs on them which you are to read. Read them as rapidly as you can, and at the same time get the thought. Remember that your skill depends upon getting the thought as well as reading rapidly.

"In a little while after you have begun to read you will be told to stop. When you hear this signal, note the word you were just reading when the signal 'stop' was given and underline it with your pencil. After you have done this, you may continue reading to the end of the selection.

"Place the long sheets directly in front of you, keeping them face down. As soon as you hear the signal to begin, turn the paper over and read as directed."

d) Emphasize the various points in the directions to the pupils a second time. Be sure that the pupils know exactly what they are to do. In case your tests should include some for the second grade, give the directions as carefully as you can. If the results are not satisfactory, send them just the same. It will enable me in the future to plan better for this grade.

e) When all is in readiness to begin, give the signal "begin." Allow exactly sixty-two seconds to elapse between the signal "begin" and the signal "stop." This allows two seconds in which the pupils may turn the papers and make other necessary adjustments for the reading.

f) When the signal "stop" is given, re-emphasize the point that the exact word must be underlined. When the pupils have marked the word properly, direct them to continue the reading. As rapidly as they finish the reading they should lay the papers aside.

g) When all but the very slowest pupils have finished, direct all to take the question sheet, read the questions, and write the answers to each in the spaces between the questions.

Three thousand one hundred sixty-one records were returned. All the records were used in making the first estimate of the relative difficulty of the selections. The average number of words read per second was determined by grades for each selection. The answers to the questions were checked and a grade of 10 given for each question correctly answered. Table XXVII gives the number of pupils in each grade who read each selection, the average number of words read per second, and the average percentage grade for questions answered correctly.

The first question to be answered as a result of this study relates to the advisability of adopting a test composed of three selections. Such a plan would be feasible provided the respective selections were of such difficulty that the lowest grades in each case would be able to make a fair record and the highest grades would have ample opportunity to put forth their best effort. Table XXVII shows that in the case of each selection these conditions have been met for speed and in most cases for quality. In the series of selections entitled "Tiny Tad," "Grasshoppers," and "Ancient Ships" the speed gradually increases for each selection. The quality scores increase in a corresponding manner, and the range in average quality scores of the different grades for each selection is

sufficiently wide to satisfy the conditions mentioned above. A careful study of individual records showed that no special violence would be done to the unusually bright or slow pupil by this method.

TABLE XXVII
SPEED AND QUALITY RECORDS FOR 3,161 PRELIMINARY TESTS

Grade	No. of Pupils	Words per Second	Answers to Questions	No. of Pupils	Words per Second	Answers to Questions	No. of Pupils	Words per Second	Answers to Questions	Total No. of Pupils
	TINY TAD			NUISANCE			BROWNIE			
II.....	118	1.16	12	125	1.17	3	43	1.78	10	286
III.....	149	2.00	26	81	1.93	11	122	1.91	24	352
IV.....	143	2.40	34	132	2.13	18	61	2.73	33	336
	GRASSHOPPERS			OPEN WELL			SAND HILLS			
IV.....	103	2.07	27	218	2.78	22	49	2.03	20	370
V.....	245	2.55	39	143	2.71	30	36	2.30	34	424
VI.....	112	2.66	56	44	4.16	33	169	3.00	47	325
	ANCIENT SHIPS			ANCIENT BUILDERS			ANCIENT ARTILLERY			
VI.....	70	2.36	22	166	2.83	30	141	2.50	18	377
VII.....	130	2.87	30	153	2.78	36	118	2.83	30	401
VIII.....	45	3.06	38	79	3.40	37	166	3.16	42	290
										3,161

The second purpose of the preliminary test was to determine which of the selections would form a series increasing in difficulty by appropriate steps of difference. The data secured in this study did not prove entirely adequate for this purpose, because the number of pupils who read the same two successive paragraphs was small in each case. It was decided, therefore, to choose those selections which had proved most successful in a general way in the preliminary study. Upon this basis "Tiny Tad," "The Grasshoppers," and "Ancient Ships" were chosen. Table XXVII shows that these selections increased in difficulty quite regularly both as to speed and as to quality for the successive grades.

The preliminary study offered a number of valuable suggestions concerning the more effective organization of silent-reading tests. Certain radical changes in the structure of the subject-matter and

in the character of the questions were shown to be desirable. Practically all teachers affirmed that a test which requires second- and third-grade pupils to write their answers to the questions penalizes these pupils unduly, because writing in itself presents many difficulties at this stage of the development of pupils. Many teachers questioned the reliability of the rate when it was indicated by the pupil's own mark. Concrete cases were cited in justification of this criticism. Several teachers tested the pupils on their comprehension of what was read in other ways than by means of questions. They concluded from the results that questions alone do not afford a sufficiently broad basis for testing comprehension. Finally the suggestion was offered that it frequently required several seconds for pupils to adjust themselves to the conditions and subject-matter of the test, and that pupils should be allowed to read several seconds before the experimenter begins the time record.

As a result of this preliminary study and the suggestions which grew out of it, the silent-reading tests were organized as presented in chap. iii. For the purpose of this thesis it was very desirable to devise a test which would be as accurate as possible. Wherever questions arose, ease of giving the tests was usually sacrificed for increased accuracy in results. Different characteristics of the test will now be taken up in turn and discussed from the standpoint of validity.

CRITICAL DISCUSSION OF THE ADOPTED METHODS OF TESTING SILENT READING

Form in which the test was printed.—To obviate the difficulty presented by the fact that the pupil's own record of his achievement is sometimes inaccurate, the revised test was given individually and the rate was recorded by the teacher. This method has the negative advantage that it does not interrupt the pupil's reading at any point. The positive advantages of the method are that it enables the teacher to make a personal study of the pupil while he is reading, and it imposes the responsibility of accuracy upon the teacher. Pupils have many habits connected with their reading, such as excessive lip movement, pointing with finger, and

poor position of the book, which are positive handicaps to effective reading. Furthermore, some pupils are unable to shift the eye accurately from the end of one line to the beginning of the next. Personal study and observation of the reader frequently enable the teacher to determine the causes of inefficiency. Since it is more important to know why a pupil fails than it is to know simply that he is failing, the advantages of an individual test more than outweigh the disadvantages of greater time and labor involved, particularly for the purpose of the present study.

The difficulties which arose from the fact that pupils vary in the time at which they begin and discontinue their reading and in the readiness with which they adapt themselves to the subject-matter which is to be read and to the conditions of the test were obviated in the following ways: The subject-matter of each test was printed on a cardboard in three columns. The middle column contained 100 words in the case of "Tiny Tad" and 200 words each in the case of "The Grasshoppers" and "Ancient Ships." The short column to the left enabled the reader to assume his natural rate of reading before the time record began. Variations in rate due to the fact that pupils begin and discontinue their reading at slightly different time periods were obviated by the fact that each pupil's record was secured while he was reading at his normal rate in the middle of the selection. The fact that the reader had to shift his eyes from the bottom of the first column to the top of the second and again from the bottom of the second column to the top of the third enabled the investigator to note accurately the time at which the reading of the second column began and ended.

Length of the test.—Several points were considered in determining the length of the reading tests. In the first place, practical considerations require that the shortest test be used which will secure accurate results. Concerning the relation of the length of the test to the rate of reading, Starch (*Journal of Educational Psychology*, VI, 8) shows that the number of words read per second is practically the same whether a person reads for 30 or for 60 seconds. He therefore concluded that a test of 30 seconds was sufficiently long to insure accuracy. Since many pupils read the selections involved in this test in less than 30 seconds, the following study was made:

A group of eighth-grade pupils were tested first upon "Ancient Ships" and then upon a selection the middle column of which contained 500 words. The results of this test showed that the average rate of reading was the same whether the middle column contained 200 words or 500 words. It was concluded, therefore, that the tests as devised were sufficiently long to serve as accurate measures of rate.

Tests conducted by Miss Katherine McLaughlin in the Elementary School of the University of Chicago show that fifth-grade pupils reproduce and answer questions concerning the latter portions of a selection less well than concerning earlier portions if the selection is over 300 words in length. This proved to be true if either the earlier or the latter portions were reproduced first. She concluded that fatigue or memory span was a real factor in tests which involve long selections. For the purpose of eliminating as many variable elements as possible it was decided to limit the silent-reading tests to less than 300 words. The selection for the second and third grades was made 100 words shorter than the selections for the upper grades. This reduction was made because pupils of the lower grades read much more slowly than pupils of the upper grades.

Reliability of a single record for rate.—To determine the reliability of a single record for rate, the following investigation was made: A class of 19 pupils was tested on each of two selections, the one somewhat more difficult than the other. Table XXVIII gives the results for each selection in terms of the number of seconds required by each pupil to read 200 words (see p. 106).

The correlation between the two rankings, as computed by Spearman's footrule, is $+0.88$. This indicates a high degree of accuracy in a single record for rate.

Method of determining rate.—In order that the average achievement of groups of individuals as to rate of silent reading might be represented numerically, the harmonic mean of the rates (the arithmetical mean of absolute times) was adopted. This average was then expressed in terms of the number of words read per second.

Comprehension based on reproduction and answers to questions.—When a pupil tries to understand what he reads, a number of complex processes are involved. The entire meaning which he secures

is the result of this total mental activity. Meaning may take various forms, such as general impressions, feelings of assent or disapproval, a mental record of the most important points, a mental record of practically all the details, a recognition of the relationship of the facts expressed to other known facts, etc. It would be impracticable in an investigation of this type, even if it were possible, to test meaning in all its forms, on account of the amount of

TABLE XXVIII
INFLUENCE OF DIFFERENT SELECTIONS ON RANK IN SILENT
READING

PUPIL	SELECTION A		SELECTION B	
	Time in Seconds	Rank	Time in Seconds	Rank
1.....	17	1	23	1
2.....	20	2	27	3
3.....	20	3	31	8
4.....	22	4	26	2
5.....	22	5	28	4
6.....	22	6	29	5
7.....	23	7	29	6
8.....	29	8	32	10
9.....	30	9	31	9
10.....	30	10	33	11
11.....	30	11	43	13
12.....	31	12	43	14
13.....	32	13	47	16
14.....	32	14	30	7
15.....	34	15	45	15
16.....	35	16	40	12
17.....	38	17	60	19
18.....	40	18	57	17
19.....	40	19	59	18

time which would be required. For the purpose of this study it seemed best to test by at least two methods. Reproduction and answers to questions were the means adopted because they represent two of the most frequent ways in which comprehension is tested in our schools today. That both methods form a better test than either one alone is shown by the fact that pupils vary widely in their ability to reproduce and to answer questions. The records in Table XXIX show that some pupils do relatively well by one method and relatively poorly by the other.

Oral reproductions below the fourth grade.—The fact has been pointed out that second- and third-grade pupils are greatly handicapped by the requirement that they write their own reproductions. Tests were given in all grades from the second to the sixth inclusive

TABLE XXIX
RELATIVE ACHIEVEMENT OF PUPILS IN REPRODUCTIONS
AND ANSWERS TO QUESTIONS

Grade	Pupil	Reproduction Score	Question Score
IIB.....	a	14	30
	b	12	30
	c	6	30
VIA.....	a	30	60
	b	25	60
	c	22	60
	d	17	60
	e	10	60
	f	15	80
	g	27	60
	h	28	40

to determine the relative efficiency with which pupils report orally and write their reproductions. The pupils were first tested on their ability to reproduce a selection orally. Upon the basis of these results the class was divided into two groups of equal ability.

TABLE XXX
COMPARISON OF THE PERCENTAGE REPRODUCED ORALLY
WITH PERCENTAGE REPRODUCED IN WRITING

Selection	Grade	Written Reproduction	Oral Reproduction
Tiny Tad.....	II	5.0	20.0
Tiny Tad.....	III	14.0	25.0
The Grasshoppers.	IV	14.3	15.8
The Grasshoppers.	V	17.0	18.0
The Grasshoppers.	VI	20.3	20.5

One section of each grade then read "Tiny Tad" or "The Grasshoppers" and reproduced the selection in writing. The second section of each grade gave the reproduction orally. Table XXX gives the average reproduction scores for each section of each grade.

The table shows that pupils in the second and third grades are distinctly handicapped by the requirement that they write their reproductions. Even in the fourth, fifth, and sixth grades those who report their reproductions orally do slightly better than those who write them. The difference is so small, however, that it need not be considered seriously. In the light of this evidence the method was adopted of having second- and third-grade pupils report their reproductions orally and of having the pupils of all other grades write.

Method of scoring reproductions.—The method used in this investigation for scoring reproductions was as follows: All erroneous statements, all repetitions, and all irrelevant statements were checked from the pupils' reproductions and the remaining words were counted. The ratio of these words to the total number of words read was taken as the reproduction score. This method is very similar to the "word-counting method" adopted by Starch (*Journal of Educational Psychology*, VI, 7). The only difference is that Starch takes the total number of words reproduced as the index of comprehension, while the method followed here takes the percentage of words correctly reproduced as the index of comprehension.

A sample test follows to illustrate the method of scoring. It is a test of a second-grade girl. She wrote 69 words, 13 of which were checked from her reproduction. Since she read 174 words and reproduced 56 of them correctly, her reproduction scores 32 per cent.

Tiny Tad was a queer little fellow. He was nearly black. He said, "When I ~~grow up and~~ get my legs I am going to hop around to the orchard. I wish I had a brother to hop with me." One morning a little toad scrambled out on the bank. It was Tiny Tad. He had grown his hind legs, ~~and was now hopping around as any other toad would.~~

For the purpose of checking the results of this method of scoring with the "group-idea method" which has been widely used, the selections were analyzed according to the suggestions of Judd (*Elementary School Teacher*, XIV, 371). The significant feature of the method is that the unit of measurement is a group of ideas in significant relationship. After the selections had been analyzed

into group-ideas according to the judgment of the writer, the groups of ideas selected were compared with the grouping which appeared most frequently in the pupils' reproductions. Whenever there was doubt concerning the best grouping or whenever the grouping selected differed materially from that given by the pupils, the practice of the majority of the pupils was accepted as the standard. The final analysis of "Tiny Tad" was as follows:

TINY TAD

Tiny Tad was a queer little fellow | with only two legs | and a short tail. | He was nearly black, too, | and much smaller than most tadpoles | in the big pond. | He could hardly wait | for his front legs to grow. |

"When I have them all," | he said, | "I'll leave this dirty water | and go up into the orchard. | What fun it will be | to hop and hop and hop. | If only I had a little brother | to hop with me, | I should be so happy." |

It wasn't long | before his legs began to grow. | He moved about | and kicked around | until his legs were quite strong. | "I am going out on the bank | to see if I can hop," | he said | one night | when he was just six weeks old. |

The sun was hardly up | the next morning | when a little toad jumped out of the water | and hopped up on the bank. | He was very small, | but none too small for the little legs | that wobbled under him. | It was Tiny, | the young toad. |

According to this analysis, each sentence is divided into several group-ideas, each of which when accurately reproduced is given full credit. If a group-idea is partially reproduced, it is given half-credit. If a totally new or wrong idea is introduced, it is checked out. If a group-idea in the reproduction represents an accurate combination of portions of the ideas in two or more groups, it is given full credit for one, one and one-half, or two group-ideas of the original text, according to its content and quality. The following illustration will make clear this method of scoring. The numbers to the left of the lines represent the amount of credit given for each group of ideas.

REPRODUCTION BY A THIRD-GRADE PUPIL

- 1 "Tiny Tad was a queer little fellow."
Full credit.
- 1 "He was nearly black."
Full credit.

- 1 "He said."
Full credit.
- 1 "When I (~~grow-up-and~~) get my legs."
Equivalent to "when I have them all."
- 1 "I am going to hop (~~around~~) in the orchard."
Two groups incompletely reproduced. Given credit for one.
- 2 "I wish I had a brother to hop with me."
Full credit for two group ideas.
- $\frac{1}{2}$ "One morning."
Not so specific as "the next morning."
- 1 "A little toad scrambled out of the pond."
Portions of two groups. Given credit for one.
- 1 "It was Tiny Tad."
Full credit.
- $\frac{1}{2}$ "He had grown his hind legs."
A true statement but given out of connection.
"And was now hopping around as any toad would."
A true statement, but none similar to it is made in the original, and hence it is not counted.

According to this analysis, 10 of the 36 group-ideas are reproduced. Reduced to a percentage basis, the reproduction score is 28 per cent. According to the word-counting method, 56 out of 174 words were reproduced correctly. Expressed on a percentage basis, the reproduction score is 32 per cent. According to this illustration, the group-idea method which endeavors to evaluate more accurately the various phases of the reproduction is a more severe method of scoring than is the word-counting method. In order that the similarity of results secured by the two methods might be determined, the reproductions of 220 pupils in six grades of the Elementary School of the University of Chicago were scored by both methods. The results are given in Table XXXI.

The table shows that the average scores by the word-counting method are higher throughout the grades. The differences between the two scores are remarkably uniform. The reproductions were scored a second time by the two methods. The class averages were practically the same in each case as those which were secured by the first scoring. The individual scores varied very little for the two scorings by the word-counting method. Some variations appeared in the scores by the group-idea method. It therefore

appeared that the word-counting method was the more constant measure as well as the more rapid measure.

TABLE XXXI

COMPARISON OF REPRODUCTION GRADES WHEN SCORED BY THE "WORD-COUNTING" METHOD AND BY THE "GROUP-IDEA" METHOD

Selection	Grade	No. of Pupils	Counting Words	Group-Idea	Difference
Tiny Tad.....	IIB	12	8.1	7.5	.6
Tiny Tad.....	IIA	15	25.2	22.0	3.2
Tiny Tad.....	IIIB	14	29.0	26.3	2.7
Tiny Tad.....	IIIA	15	29.0	26.0	3.0
Tiny Tad.....	IVB	28	31.7	28.6	3.1
Tiny Tad.....	IVA	20	35.3	32.0	3.3
The Grasshoppers.....	IVA	20	20.0	16.5	3.5
The Grasshoppers.....	VB	16	23.0	18.5	4.5
The Grasshoppers.....	VA	21	25.0	21.5	3.5
The Grasshoppers.....	VIA	25	24.6	20.6	4.0
The Grasshoppers.....	VIIA	17	28.0	24.0	4.0
Ancient Ships.....	VIIA	17	25.0	22.0	3.0

Amount of credit given for correct answers to questions.—A credit of 10 points was given for each question answered correctly. Theoretically this method of grading would be accurate provided the questions were of equal difficulty. Now, in fact, the questions are not of equal difficulty if we take the number of times each question was answered correctly as an index of difficulty. However, the relative difficulty of the questions differed for different schools. The experiences of individuals and classes differ widely, and it is legitimate to expect that some questions will be less difficult for some than for others. Hence the course of procedure which was adopted for this study was to secure a list of questions so difficult that very few pupils of a class would be able to answer all the questions and at the same time easy enough so that no pupil would fail entirely unless he were an exceptional case. After a long period of experimentation, the questions used in this study were adopted. The number of times that each question was answered correctly by the first one hundred pupils who took each test after the final lists of questions had been chosen is shown in Table XXXII.

The numbers show that the questions which were selected fulfil the conditions mentioned above. After the desired degree of uniformity in the difficulty of the questions had been secured, it was

arbitrarily decided to give a credit of 10 points for each question correctly answered.

TABLE XXXII
RELATIVE DIFFICULTY OF THE QUESTIONS FOR EACH
SELECTION

Question	Tiny Tad	The Grasshoppers	Ancient Ships
1.....	74	69	50
2.....	74	51	70
3.....	55	63	84
4.....	47	29	75
5.....	80	50	60
6.....	41	48	30
7.....	43	52	48
8.....	30	60	56
9.....	53	39	40
10.....	20	58	42

VALIDITY OF THE STANDARDS OF ACHIEVEMENT IN SPEED AND
QUALITY OF SILENT READING

In order to determine the steps of difference in difficulty between the respective selections and to derive standards of achievement for each grade, 2,654 tests were given in 13 cities of Iowa, Minnesota, Tennessee, and Illinois. In general, the same instructions were used in giving these tests as are outlined in chap. iii. One important addition should be mentioned. To determine the relative difficulty of the various selections, it was necessary to have certain grades read two selections. Therefore fourth-grade pupils were asked to read both "Tiny Tad" and "The Grasshoppers," and sixth-grade pupils were asked to read both "The Grasshoppers" and "Ancient Ships."

After all the tests had been given, a record was made of the number of seconds required by each pupil to read 100 words. These rates were tabulated in order from the most rapid to the slowest. For the purpose of this report the records have been grouped as follows: Those pupils who required from 0 to 4 seconds, from 5 to 9 seconds, from 10 to 14 seconds, from 15 to 19 seconds, etc., were grouped together. The results for 2,654 pupils appear in Table XXXIII.

TABLE XXXIII

DISTRIBUTION OF 2,654 PUPILS WITH REFERENCE TO THE TIME REQUIRED TO READ 100 WORDS SILENTLY

No. of Seconds	No. in Grade II	No. in Grade III	No. in Grade IV	No. in Grade IV	No. in Grade V	No. in Grade VI	No. in Grade VI	No. in Grade VII	No. in Grade VIII
0- 4.									
5- 9.									
10-14.			6	2	1	2	4	2	2
15-19.	4	7	18	8	3	6	4		11
20-24.	4	25	37	24	32	25	18	16	21
25-29.	5	27	42	19	43	73	41	57	38
30-34.	14	57	72	46	79	64	54	86	60
35-39.	17	44	51	36	64	63	66	74	44
40-44.	17	39	46	38	52	49	54	52	40
45-49.	21	34	24	45	35	42	50	34	19
50-54.	32	46	22	35	32	20	31	30	16
55-59.	34	12	15	27	25	16	18	23	4
60-64.	38	34	10	27	21	5	15	16	4
65-69.	25	17	12	13	10	6	6	5	6
70-74.	24	21	4	3	8	3	7	2	
75-79.	23	10	3	16	3	2	3	4	3
80-84.	23	7		5	2	1	1	3	2
85-89.	15	6	1	7	7		1		
90-94.	17	7	4	5	3		2		
95-99.	6	3		7			1		
100-104.	10	5		1	1				1
105-109.	7	1	1	6					
110-114.	9	3	2						
115-119.	5	1	1	2	1		1		
120-124.	10	1	1	1					
125-129.	6	1							
130-134.	3		1						
135-139.	1								
140-144.	4	1							
145-149.		1							
150-154.	1								
155-159.	3	1							
160-164.	2	2							
165-169.	2								
170-174.	1								
180-184.	1	1							
185-189.		1							
190-194.	1								
195-199.	1								
200-204.	1	1							
205-209.		1							
225-229.	1								
285-289.	1								
Total.....	389	417	373	373	422	377	377	405	271
Median time.....	66	45	35	45	39	37	40	37	35
Average time.....	66.6	43.4	33.4	45.5	38.9	35.8	39.2	37.2	34.8
Words per second.	1.5	2.3	2.99	2.2	2.57	2.79	2.55	2.69	2.87

From the facts presented in Table XXXIII it has been possible to plot a curve of progress for rate of silent reading. Diagram VIII represents the progress of 2,654 pupils in silent reading and may be used as a standard for comparison. The diagram was constructed as follows: The vertical lines in the table represent the grades from the second to the eighth inclusive. The numbers 1.00, 2.00, 3.00, and 4.00 to the left of the diagram designate the rates at which second- and third-grade pupils read "Tiny Tad"; the numbers 1.21, 2.21, and 3.21, between the third and fourth grades, designate

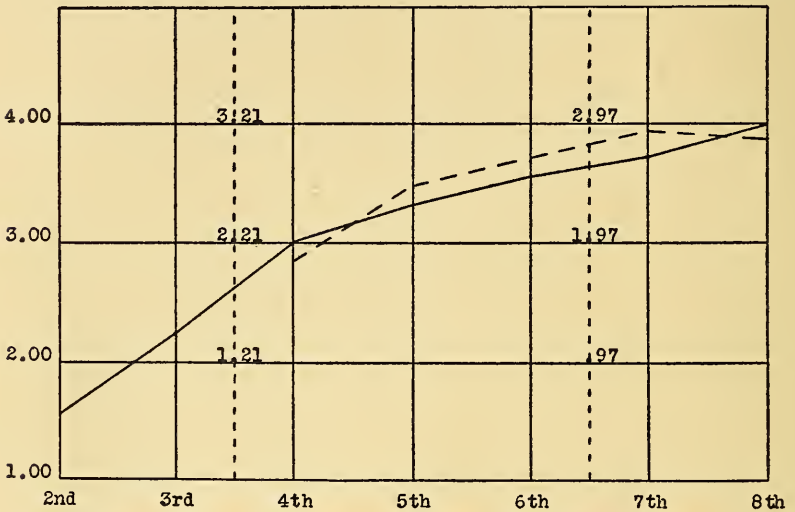


DIAGRAM VIII.—Progress of 2,654 pupils in rate of silent reading

the rates at which fourth-, fifth-, and sixth-grade pupils read "The Grasshoppers;" and the numbers .97, 1.97, and 2.97, between the sixth and seventh grades, designate the rates at which seventh- and eighth-grade pupils read "Ancient Ships." These readjustments in the diagram were made as follows: Fourth-grade pupils read "Tiny Tad" at a rate of 2.99 words per second and "The Grasshoppers" at a rate of 2.20 words per second. The numbers designating the rates for fourth-, fifth-, and sixth-grade pupils were shifted along the vertical axis until a rate of 2.20 words per second for "The Grasshoppers" was equivalent to a rate of 2.99 words per second for "Tiny Tad." Similarly, the numbers designating

the rate for seventh- and eighth-grade pupils were so arranged along the vertical axis that a rate of 2.55 words per second for sixth-grade pupils reading "Ancient Ships" was equivalent to a rate of 2.79 words per second for "The Grasshoppers." Upon the basis of this organization the curve of progress was drawn as represented in the diagram. In order to determine the extent to which this assumed curve of progress represents the real curve of progress through the grades, 200 pupils from the fourth to the eighth grades inclusive were tested on "Tiny Tad." The results are represented by the dotted line in the diagram. The close correspondence between the assumed curve and the curve for the pupils involved in the check test justifies the belief that the assumed curve represents quite accurately the increase in rate of silent reading through the grades.

The reproductions and the answers to questions were scored according to the method described on p. 54. The average of these two scores for each pupil was adopted as the comprehension score. The comprehension scores were then arranged in order from the lowest to the highest. They are presented in summary form in Table XXXIV.

The progress in quality of silent reading for 2,654 pupils is represented in Diagram IX and may be used as a basis for comparison. This diagram was constructed and should be interpreted in the same way as Diagram VIII.

To determine the extent to which this assumed curve represents the real curve of progress in quality of silent reading, the reproduction and answers to questions were scored for 200 pupils in the grades from the fourth to the eighth inclusive. These results are represented by the dotted line in Diagram IX. Again the very close correspondence between the assumed curve and the real curve would indicate that the former represents with a fair degree of accuracy the curve of progress in quality of silent reading.

Limitations of the silent-reading tests.—The silent-reading tests measure three things: namely, rate of reading a given selection, ability to reproduce what is read, and ability to answer specific questions concerning the subject-matter. To test comprehension in a thoroughgoing way, a number of selections should be used

rather than one, and a larger number of tests of what one gets out of his reading should be included.

The selection entitled "Ancient Ships" is relatively more difficult for pupils in the seventh and eighth grades than are "The Grasshoppers" and "Tiny Tad" for pupils in the intermediate and lower grades, respectively. More satisfactory, but perhaps no more accurate, results might have been secured had the selection for the upper grades been less difficult.

TABLE XXXIV

DISTRIBUTION OF 2,654 PUPILS WITH REFERENCE TO SCORES FOR QUALITY OF SILENT READING

Comprehension Score	No. in Grade II	No. in Grade III	No. in Grade IV	No. in Grade IV	No. in Grade V	No. in Grade VI	No. in Grade VI	No. in Grade VII	No. in Grade VIII
0-4.....	4	.....	.....	16	7	4	22	17	9
5-9.....	13	5	2	22	24	6	61	35	25
10-14.....	19	15	8	30	26	10	66	58	32
15-19.....	34	14	16	35	44	17	63	67	34
20-24.....	41	33	22	50	40	29	50	64	24
25-29.....	60	50	27	49	48	35	32	42	20
30-34.....	57	58	46	39	51	44	27	40	32
35-39.....	54	65	54	38	38	44	18	26	24
40-44.....	42	50	60	39	45	48	13	18	25
45-49.....	24	38	40	26	39	44	8	11	20
50-54.....	15	41	41	14	35	32	8	11	9
55-59.....	6	24	30	10	16	32	4	8	7
60-64.....	8	14	17	4	6	12	4	4	4
65-69.....	6	8	4	.....	2	10	.....	3	2
70-74.....	3	2	3	.....	1	9	1	1	4
75-79.....	2	.....	2	1	.....	1	.....	.....	.....
80-84.....	1	.....	1	.....	.....	.....	.....	.....	.....
Total.....	389	417	373	373	422	377	377	405	271
Median.....	31	37	40	28	32	39	18	22	26
Average.....	31.5	37.3	40.6	28.8	31.8	39.1	18.0	21.6	26.9

The tests are given individually and therefore require considerable time and effort. The method of scoring results is slow and somewhat laborious. The tests are therefore not so well adapted to practical schoolroom purposes as are many of the tests described in chap. ii. From the point of view of their value as aids in educational diagnosis and supervision these tests are distinctly superior to some which are more easily administered, because they afford to the teacher an excellent opportunity to make a careful study of the difficulties of each pupil during the course of the test. For

the purpose of this investigation they have made it possible to secure a body of very valuable data.

The method used in this study for scoring reproductions is open to the criticism that unless investigators are carefully trained the scores given by different investigators to the same reproduction will vary. For the purpose of determining the extent to which this criticism is true, ten graduate students were asked to grade each of ten reproductions. The average variation of the individual

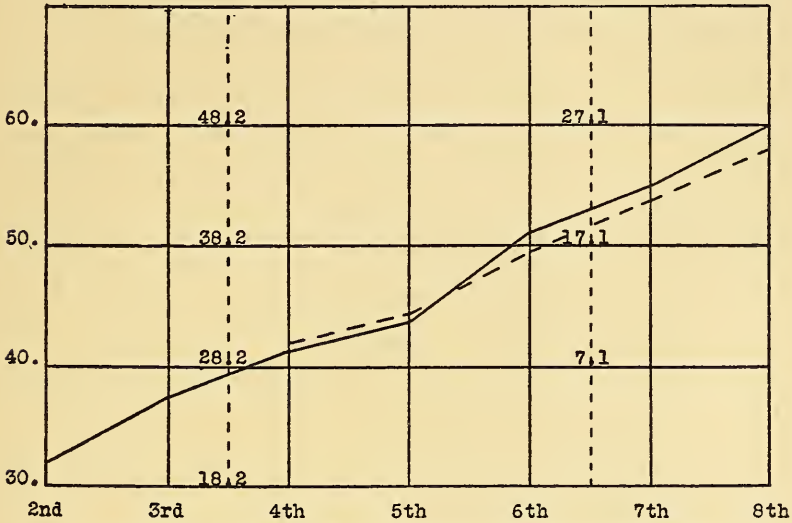


DIAGRAM IX.—Progress of 2,654 pupils in quality of silent reading

scores was 1.5 per cent. In a recent investigation carried on in 10 cities each classroom teacher scored the tests for his own grades. All of the papers were then rescored by a highly trained student. The average variation between the quality scores secured by the teachers and by the trained student was less than 1.5 per cent.

Any inaccuracy in the curves of progress which is due to the limited number of cases for each grade will be corrected as more data accumulate.

CHAPTER VI

THE INVESTIGATION OF READING IN A CITY SYSTEM

It was stated at the outset that the purpose of this investigation was to make a study of the achievement of pupils in oral and silent reading. A very large part of the discussion up to this point has been devoted to a description of the methods employed in securing the desired facts. It is the purpose of this chapter to present the results which were secured through the use of oral- and silent-reading tests in an investigation in Cleveland, Ohio. A large part of the results which are presented in this chapter has already appeared in the chapter on reading in the Cleveland Survey monograph entitled *Measuring the Work of the Public Schools*. The material was rearranged several times during the preparation of the monograph report. Additional points are included in the present report in order to give added emphasis to certain general conclusions which the data justify. The writer wishes to acknowledge his indebtedness to Dr. Charles H. Judd and Dr. Leonard P. Ayres for many criticisms and much constructive help which were offered during the course of the investigation, and for many suggestions concerning the interpretation of the results.

IMPORTANCE OF READING INVESTIGATIONS

In the investigation of the quality of the teaching in any city system the progress which the pupils make in reading should be given very large consideration. Evidence of the vital importance of this subject is found in the fact that a pupil's progress through school depends to a large extent upon his ability to master the thought of the printed page. Furthermore, it is necessary to keep the relative importance of oral and silent reading clearly in mind. In most ordinary situations of life one reads silently for the purpose of gathering ideas and not for the purpose of oral exhibition. Hence, one of the most important purposes of a school should be to train its pupils effectively in the art of silent, individual mastery

of the printed page. With these points in mind the investigation of reading in Cleveland was undertaken. The tests of oral and silent reading described in chaps. iv and v were used in all of the schools tested. Through their use it was possible to secure a body of facts upon which to base conclusions concerning the achievement of pupils in various phases of oral reading and of silent reading.

DESCRIPTION OF THE SCHOOL POPULATION TESTED

The oral-reading test was given in 44 schools. A preliminary list of 50 schools was selected with three considerations in mind: the first was that the schools tested should represent all sections of the city; the second, that schools using different methods of teaching reading should be included; and the third, that all nationalities should be represented. From this preliminary list of 50 schools, 40 schools were chosen which could be reached most easily by those giving the tests. Arrangements were made later for giving the tests in the three training schools of the city and in another public school. This brought the number of schools tested to 44. Because of the care used in selecting the schools it is felt that the pupils tested represented very well the school population of the city.

Within each school the number of grades and the number of pupils which were tested varied slightly. In most schools the following plan was adopted: Pupils from the A divisions of the first four grades of each school were tested. If the examiners had sufficient time, each of the upper grades was tested; if they did not have time to examine all grades, either the fifth and seventh grades or the sixth and eighth grades were tested in addition to the first four.

Because of the limitations of time only 7 pupils from each grade were tested in the case of most of the schools. These pupils were chosen as follows: The teacher was asked to select from her grade, according to her best judgment, the boy and girl who ranked lowest in the class in reading, the boy and girl who ranked highest, and 3 pupils of average ability. In a number of schools, however, as many as 15 pupils from each grade were tested. In all, 2,200 pupils were tested, making an average of 50 pupils per school.

METHOD OF TRAINING THOSE WHO GAVE THE TESTS

The tests were given in 40 schools by 80 Seniors of the normal school. In the remaining four schools the teachers of the respective grades gave the tests. The normal-school students were carefully trained for this work. A general meeting of the students was held at which printed directions were distributed. After the method of giving the tests had been discussed in detail, a third-grade boy was tested for the purpose of illustrating concretely how the test should be given. Questioning was encouraged and everything possible was done to make the method clear. Two days later a second meeting was held. In the meantime the normal-school students tested two or three pupils to find out just where the difficulties lay. The second meeting was devoted to clearing up questions which arose during the preliminary testing. The regular classroom teachers who gave the tests received instructions through group conferences.

The writer feels that the instructions and the preliminary training received by the students and teachers qualified them to do the work effectively. Evidences of this are found in various facts. In the first place, principals of the schools in which the tests were given frequently commented on the business-like way in which the students worked. Furthermore, the test papers which were turned in by the students showed that they knew exactly what they were after. Very few papers had to be rejected as unsatisfactory.

SUMMARY OF THE ORAL-READING RESULTS BY GRADES

After the tests had been given, the results were scored by the writer according to the method described in chap. iii. The average score for each class tested is presented in Table XXXV. The relative achievement of the various classes in each of the grades is represented graphically in Diagram X. The figures for the fifth, sixth, seventh, and eighth grades are slightly inaccurate for purposes of comparison, inasmuch as all of the 44 schools are not represented. Such a large percentage of the schools is included, however, that it is felt that the distribution is representative. The numbers along the base line of the figure for each grade designate the scores for oral reading. Each square in the figure for a grade

represents the achievement of one of the classes of that grade, reported in Table XXXV. Thus the square to the left in the

TABLE XXXV
SCORES IN ORAL READING IN EACH GRADE IN 44 SCHOOLS

School	Grades							
	I	II	III	IV	V	VI	VII	VIII
Addison.....	41.95	44.40	40.00	46.60	38.05	.....	49.30	.....
Alabama.....	28.55	35.00	47.10	48.75	47.15	49.45	.....	.....
Bolton.....	36.25	44.65	47.30	39.45	.....	43.05	.....	53.55
Boulevard.....	30.35	50.55	38.20	48.00	48.75	.....	49.65	.....
Brownell.....	27.85	44.65	39.60	39.10	35.00	.....	43.40	43.55
Case.....	14.80	48.75	39.30	47.85	53.50	.....	46.40	.....
Case Woodland.	33.00	55.05	51.60	55.55	53.05	55.80	50.75	53.80
Chesterfield....	24.10	39.80	52.30	45.15	47.15	50.70	45.35	.....
Clark.....	35.70	33.05	40.15	45.90	.....	46.40	.....	47.50
Denison.....	40.00	40.90	50.90	47.65	.....	57.15	.....	51.40
Detroit.....	44.30	50.90	44.65	.....	.....	50.15	.....	51.40
Doan.....	33.40	44.15	55.00	48.05	54.30	.....	45.85	.....
Dunham.....	28.20	44.45	50.15	54.10	49.10	47.25	45.95	48.90
Eagle.....	5.90	30.15	38.90	40.00	.....	30.35	.....	44.10
Fairmont.....	27.50	45.15	47.15	45.15	.....	.....	48.55	.....
Fullerton.....	14.45	44.45	48.75	39.80	.....	.....	49.45	.....
Hazeldell.....	26.80	37.30	41.25	43.75	.....	43.75	.....	47.50
Hodge.....	49.80	44.80	51.05	48.45	52.30	07.05	46.20	39.10
Hough.....	40.00	40.00	50.85	43.95	46.65	54.30	.....	53.55
Kennard.....	27.85	37.65	45.90	47.20	47.85	.....	41.95	.....
Kentucky.....	20.60	37.25	48.75	53.50	53.50	50.90	56.85	53.90
Kinsman.....	37.65	34.10	50.00	54.45	52.90	.....	.....	.....
Lawn.....	28.40	23.55	40.00	44.65	.....	46.95	.....	50.35
Lincoln.....	33.00	41.50	49.65	48.10	.....	53.55	42.50	40.80
Mt. Pleasant....	20.00	43.20	53.20	45.90	50.55	49.50	.....	48.25
Murray Hill....	33.75	38.75	36.95	33.90	.....	.....	.....	.....
North Doan....	52.30	54.80	48.55	52.10	45.00	.....	51.40	.....
Observation....	36.05	36.90	47.10	43.45	51.50	48.15	49.80	.....
Orchard.....	48.55	45.15	42.30	41.25	.....	45.15	.....	35.70
Outhwaite.....	35.90	48.90	55.30	62.90	56.10	49.00	56.95	50.40
Quincy.....	16.40	43.90	45.34	43.05	38.20	47.50	40.90	47.50
Rice.....	36.75	43.40	48.90	51.05	48.90	46.95	52.30	48.75
Rosedale.....	32.15	50.90	39.55	43.00	47.85	53.75	42.85	40.35
Sackett.....	31.65	45.55	45.90	49.65	50.15	.....	48.75	.....
Sowinski.....	29.25	44.30	45.90	48.55	44.65	49.10	43.20	47.85
Stanard.....	8.25	39.30	41.25	46.80	49.80	.....	38.45	.....
Sterling.....	21.60	45.35	44.95	56.05	47.30	57.85	48.55	50.90
St. Clair.....	18.40	37.15	38.90	52.15	47.15	48.75	48.50	45.35
Tremont.....	15.55	47.85	46.05	49.85	.....	35.70	.....	47.85
Warren.....	25.50	48.00	42.85	50.90	48.90	.....	44.30	.....
Waverley.....	46.40	43.20	48.95	42.85	43.40	.....	51.40	.....
Willard.....	47.50	42.50	43.90	43.75	41.25	41.00	45.35	47.15
Willson.....	30.00	38.35	47.25	49.55	47.00	50.00	45.00	66.00
Woodland.....	35.00	39.80	45.90	47.80	.....	56.00	.....	48.05
Average.....	30.73	42.49	45.85	47.22	47.89	49.16	47.23	48.28

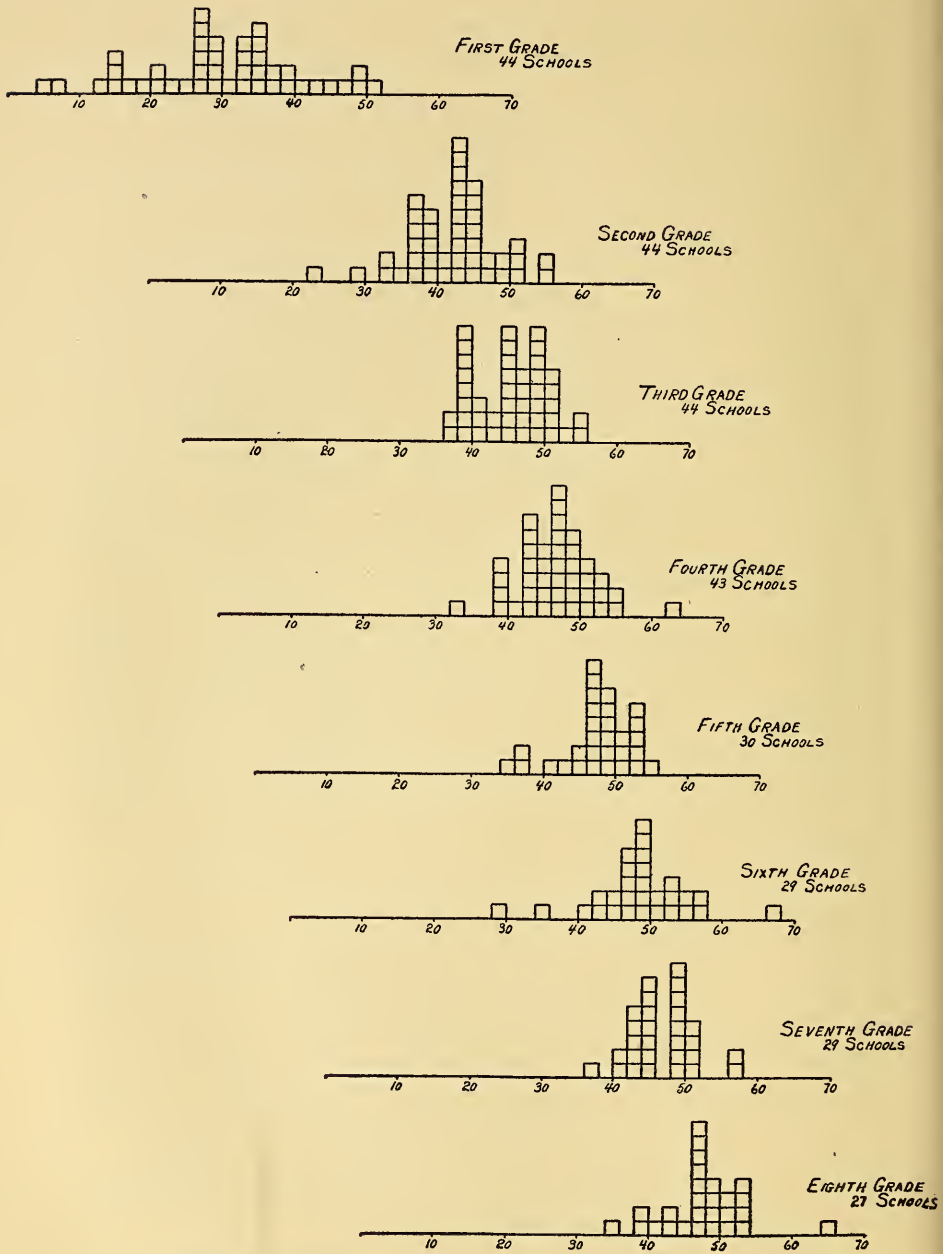


DIAGRAM X.—Graphical representation of achievement of schools in oral reading

diagram for the first grade represents the score for Eagle School, which was 5.90. The shift of the base line to the right for each successive grade shows the average increase in reading achievement from one grade to the next. These shifts are described in detail on p. 90.

The diagram shows that there is steady progress throughout the grades, more rapid in the lower grades and less rapid in the upper grades. Furthermore, the distribution of the class averages for each grade forms a fairly regular surface of distribution. When the individual scores are plotted by grades in corresponding diagrams, most of the irregularities in the frequency-curves are eliminated. It is very evident that the average attainment of classes in the first two grades varies more widely than in the upper grades. These results may be due in part to the method used in calculating the averages. On the other hand, it is apparent that first-grade classes must vary widely in Cleveland, inasmuch as the pupils of many of these classes are confronted with serious handicaps of language. One of the most impressive facts brought out by the diagram is the large amount of overlapping in the distribution of achievement in successive grades. Recent investigations of achievement in elementary-school subjects have revealed a large amount of overlapping by individuals in successive grades. Diagram X shows a large amount of overlapping in the average achievement of classes in successive grades. When we find that the average achievement of the poorest sixth-grade class is no greater than that of the best second-grade class, we are forced to question the efficiency of reading instruction in various schools and classrooms.

The records of individual pupils show even more marked variations than do the records for schools. In many third-grade classes pupils were tested who ranged in ability from those unable to read as well as an average first-grade pupil to those able to surpass an average eighth-grade pupil. In the intermediate and upper grades there were a number of pupils who were still unable to pronounce at sight some of the simpler words, and they ranked no higher in achievement than average first- or second-grade pupils. In each of the grades above the second there were many pupils who made

a very high score and for whom it is doubtful whether continued daily drill in oral reading is longer necessary.

VARIATIONS IN SCHOOLS

The average achievement of all the classes in each grade was given in Table XXXV. These averages are represented graphically by the heavy continuous line in Diagram XI. The method used

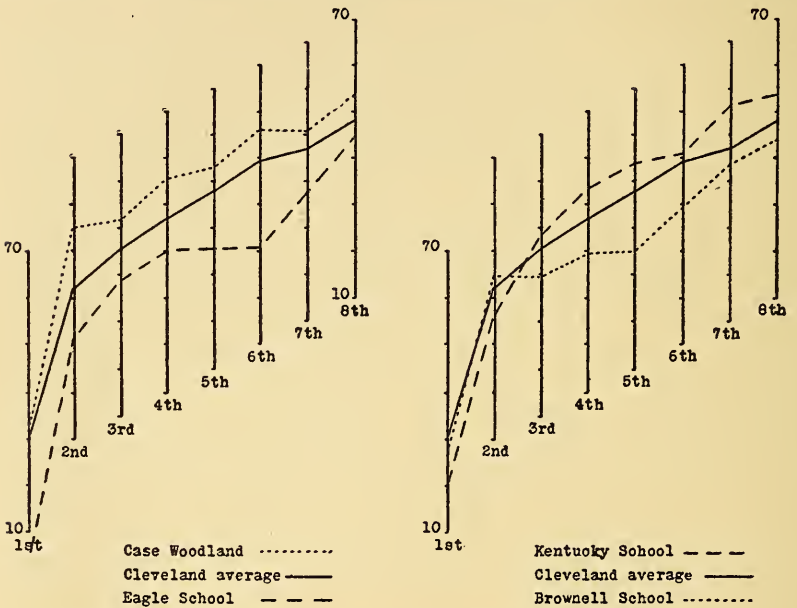


DIAGRAM XI.—Average scores in oral reading in each grade in all elementary schools and in four selected schools.

in constructing this diagram was discussed on p. 44. This average Cleveland record is the one with which individual schools and other records will be compared. The validity of the comparison of the scores made by different classes may be questioned on account of the small number of pupils tested from some classes. In all of the cases represented in Diagrams XI and XII personal observation of the work of the reading classes confirmed the impressions which the numerical scores gave.

Diagrams XI and XII represent the curves of progress in oral-reading achievement for seven schools. The Case Woodland School does well in all grades, while the Eagle School attains only a low level of achievement. The Kentucky School makes a poor start, but from the third grade on maintains a high level of achievement. The Brownell School makes a fair start, but drops below the average from the third grade on. The Rice School maintains a level close

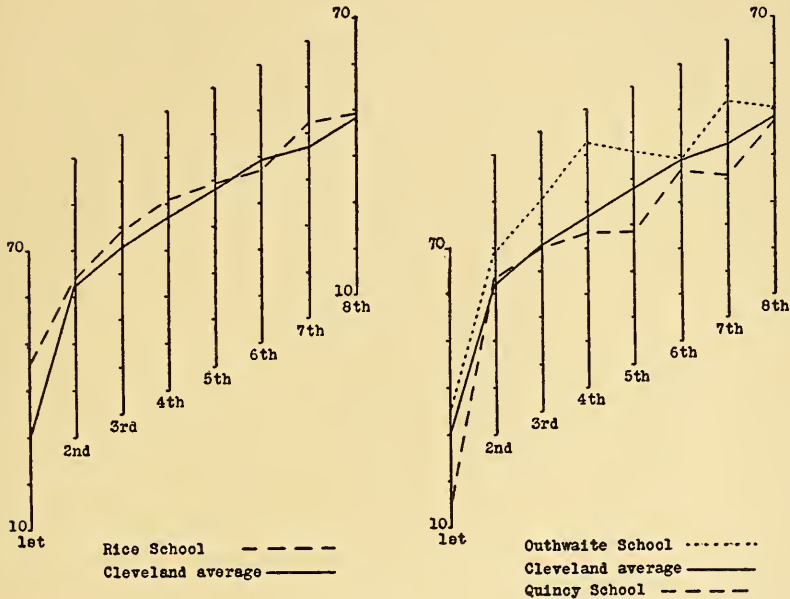


DIAGRAM XII.—Average scores in oral reading in each grade in all elementary schools and in three selected schools.

to the average throughout. The contrast between the Quinicy School and the Outhwaite School is interesting and significant. Typical objective facts upon which these differences are based are presented in Table XXXVI.

The table gives evidence of a marked difference in the two schools. In School A it would seem that the reading is fairly well done with but few errors. In School B, on the other hand, the reading is poorly done, as evidenced by the large number of omissions (*O*), substitutions (*S*), insertions (*I*), and repetitions (*R*). A

variety of explanations might be offered for the superiority of School A over School B; namely, skill of the teacher, method of teaching reading, supervision, nationality, sex, economic level,

TABLE XXXVI

SPECIMEN RECORD SHEET SHOWING THE NUMBER AND CHARACTER OF ERRORS MADE
IN THE SECOND GRADE OF TWO SCHOOLS ON PARAGRAPHS 1, 2, AND 3

SCHOOL A—GRADE II

Paragraph 1							Paragraph 2							Paragraph 3						
T	G	M	O	S	I	R	T	G	M	O	S	I	R	T	G	M	O	S	I	R
80	I	...	...	60	I	...	...	I	...	...	70	2	...	...	...	I	...
28	2	...	...	40	I	I	...	I	...	...	45	...	...	...	...	...	...
21	17	...	...	...	I	...	...	34	...	...	...	...	2	I
23	33	...	I	...	...	2	...	37	...	...	...	...	...	...
25	35	...	...	...	I	...	I	45	...	...	...	...	...	...
25	25	...	...	...	...	...	...	30	...	...	I	...	...	...
20	I	...	15	...	...	...	...	...	...	30	...	...	...	I	...	...

SCHOOL B—GRADE II

Paragraph 1							Paragraph 2							Paragraph 3						
T	G	M	O	S	I	R	T	G	M	O	S	I	R	T	G	M	O	S	I	R
16	...	I	...	I	...	...	21	...	I	I	6	...	...	23	I	...	...	I	I	I
20	I	3	...	...	17	...	...	...	I	I	...	26	...	I	...	I	I	2
20	...	I	...	I	...	...	22	...	I	...	...	...	...	30	...	...	...	I	I	...
16	I	...	...	24	...	I	...	...	...	I	31	...	2	...	...	2	...
19	26	...	...	I	I	...	...	33	...	I	...	...	...	I
56	2	...	...	4	...	...	68	2	I	...	2	...	I	42	...	3	...	I	I	I
37	2	...	...	52	...	I	...	2	...	I	55	3	2	...	4	...	...

home environment, etc. It was impossible to make a study of all these factors in this investigation. Data were secured which offered partial explanations, at least, along the following lines:

ANALYSIS TO SHOW INFLUENCE OF SEX, METHOD, AND NATIONALITY
ON PROGRESS IN ORAL READING

The average scores in oral reading were determined for boys and girls in each of the eight grades separately and the results are presented in Diagram XIII. The diagram shows that in all grades girls do better than boys in oral reading. Upon the basis of this

study, all other factors being equal, a class made up largely of boys would do less well in oral reading than a class composed chiefly of girls.

Of the 44 schools tested, 26 schools used the Aldine method of teaching reading, 17 schools used the Ward method, and 1 school used its own method. The average score by grades was computed for all schools using the Aldine method and for all using the Ward method. The results are presented in Diagram XIV. The diagram shows that differences in method of teaching reading were not accompanied by striking differences in achievement when a large number of schools were taken into consideration. A study of the records of individual schools showed that of the schools which ranked highest in the primary grades some had been taught by the Ward method and some by the Aldine method. The same statement may be made concerning the classes which ranked lowest. Both methods were equally effective with foreign-born and with native-born children. Comparisons above the third grade are of little value inasmuch as these methods were introduced about three years ago.

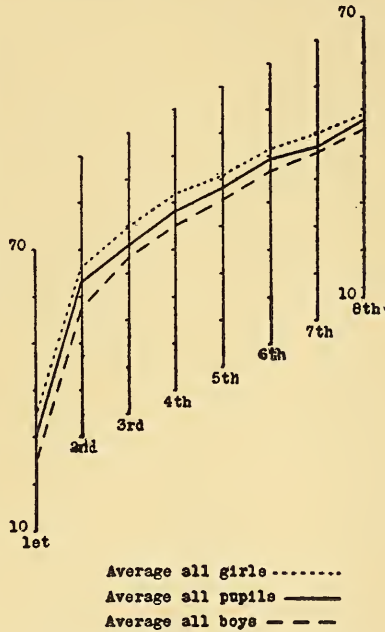


DIAGRAM XIII.—Average scores in oral reading for girls and boys in each of the eight grades.

The influence of nationality on achievement in oral reading was determined by finding the average score by grades for each school in which a given nationality constituted most of that school's population. The results are presented in Diagram XV. These results can be accepted only in a very general way, for two reasons. The first is that in the case of certain nationalities the number of schools involved is limited. Eight American schools, three Jewish schools,

and two Italian schools were included. The second reason is that it is not certain that all the pupils tested from a school in which a given nationality dominated were of that type. The results are sufficiently accurate, however, to serve in suggesting explanations for some of the earlier results reported for individual schools.

The results show that children of American-born parents are superior in achievement during the first three grades and from that

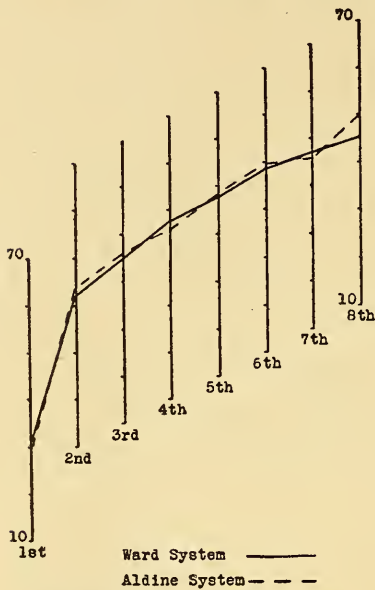


DIAGRAM XIV.—Average scores in oral reading of pupils in each grade using the Ward method and of those using the Aldine method.

point on follow the average very closely. The fact that the American child is not handicapped by unfamiliarity with the English language gives him a distinct advantage during the first few years. Italian pupils, on the other hand, are seriously handicapped. The sections of the city in which these pupils live are such that factors other than mere lack of English in the homes are probably to be recognized as contributing to the low rank of these pupils.

Jewish children on the average are distinctly ahead of the average Cleveland pupil. In spite of the fact that they are often surrounded by poor economic conditions, these children seem able to rise above their handicaps better than do other nationalities under similar conditions.

ACHIEVEMENT IN CLEVELAND AS COMPARED WITH OTHER SCHOOLS

The average achievement of the grades in Cleveland is compared with the scores of 23 typical Illinois schools in Diagram XVI. The data for the Illinois schools were secured in September, three weeks after the beginning of the fall term. The Cleveland schools were tested in June, just before the close of schools. To make the

data comparable for this diagram, the Illinois schools were considered as just completing the work of the preceding year in each grade. Comparable data are at hand only for the grades from the second through the seventh. The diagram shows that the second, third, and fourth grades in Cleveland are making distinctly more rapid progress than the same grades in Illinois, while the upper grades in each case represent more nearly the same level of achievement. When it is remembered that the school population of

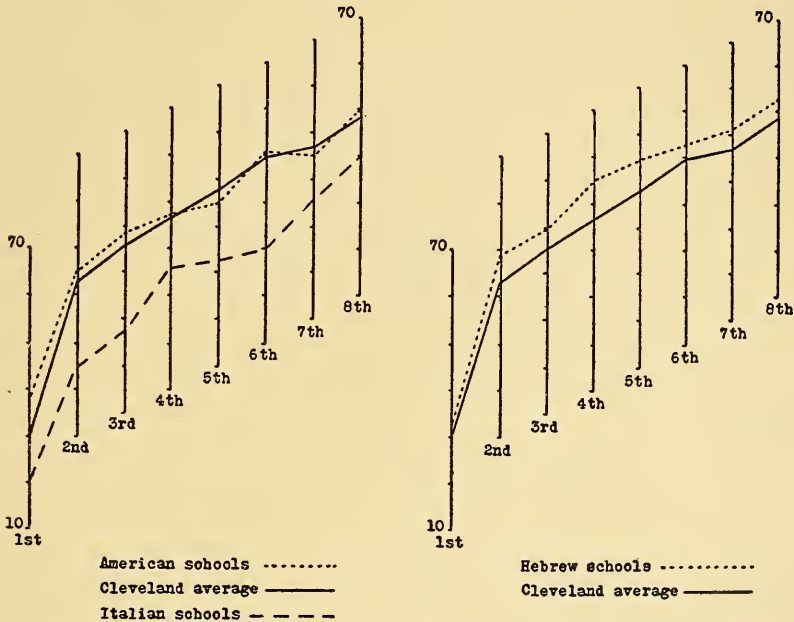


DIAGRAM XV.—Average scores in oral reading of pupils of different nationalities

Cleveland is largely foreign, while that of Illinois is largely American, the fact that Cleveland has developed a high degree of efficiency in teaching the mechanics of reading in the lower grades becomes doubly impressive. Gratifying as these results seem, there is a danger which must be pointed out. It will be shown in the next chapter that very frequently third-grade pupils have acquired the ability to pronounce words which is much in excess of their ability to secure the meaning from what they read. Furthermore, the tests in comprehension which are reported later in this

chapter show that Cleveland pupils are behind pupils of certain other cities in ability to interpret what they read. Hence it would appear that the great fluency with which the pupils of Cleveland pronounce words at sight may have been obtained at the sacrifice

of some of the other qualities which go to make up an efficient reader.

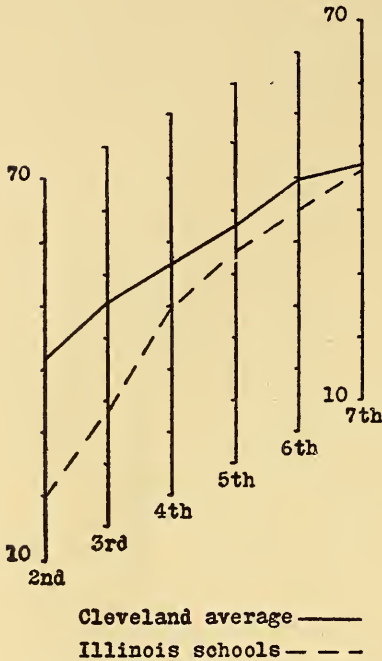


DIAGRAM XVI.—Average scores in oral reading in six grades in the Cleveland schools and in 23 Illinois schools.

follows: In the second grade 1 pupil, or 0.30 per cent, requires from 5 to 9 seconds to read 100 words; 2 pupils, or 0.61 per cent, require from 10 to 14 seconds to read 100 words, etc. The table in itself forms a surface of frequency. In the second grade the distribution is very wide indeed. Throughout the third, fourth, and fifth grades the rate of the majority of the pupils increases noticeably and the distribution decreases greatly. There is little change in the sixth, seventh, and eighth grades. The fact that there are no pupils in the seventh and eighth grades who read

RESULTS OF THE SILENT-READING TESTS

At the same time that the pupils were tested in oral reading they were also tested in silent reading. The description of the silent-reading tests, together with the directions for giving them and the methods of scoring the results, have been given in chap. iii. As in the case of the oral-reading tests, all silent-reading tests were scored by the writer.

When all the tests had been scored, they were arranged in order on the basis of the time required to read 100 words. The distribution of 1,831 pupils of Cleveland is shown in Table XXXVII. The table reads as

as rapidly as some pupils do in the lower grades may be explained by the fact that the selection for the upper grades is of such a character that it requires a more careful type of reading.

The point of greatest significance revealed by the table is that the second, third, and fourth grades represent the period at which greatest progress is made in rate of silent reading. During these years the ability of the pupil to recognize words at sight increases so rapidly that the eye moves along the lines at an increasingly rapid rate, and in a majority of cases the rate of silent reading becomes more rapid than the rate of oral reading. Some of the apparent progress in the fifth grade may be due to elimination of some of the slowest readers. The table reveals the discouraging fact that there are many pupils in the upper grades for whom silent reading is a no more rapid process than oral reading.

Comparison of Cleveland pupils with others.—Table XXXVIII presents the average speed and quality scores in silent reading of 1,831 Cleveland pupils and of 2,654 pupils of thirteen other cities. A comparison of the rates of silent reading is made in Diagram XVII. This diagram shows a marked superiority in the rate of silent reading on the part of Cleveland's pupils in all grades.

Diagram XVIII presents a comparison of the quality scores in silent reading. The results in this case are not in favor of Cleveland's pupils; in fact, the diagram shows that the results for Cleveland are decidedly low.

These comparative facts raise a most important question. Does the quality of reading always decrease when the rate increases? An answer to this question was considered of such importance that a detailed study was made of the relation which exists between speed and quality of silent reading.

GENERAL RELATION BETWEEN RATE AND QUALITY IN SILENT READING

For the purpose of this study the relation between speed and quality was determined by two methods. According to the first method, the records of the pupils of each grade were arranged in order from the most rapid to the slowest. These records were then divided into three equal groups (tertiles). The most rapid third was designated by the term "rapid," the slowest third by the term

“slow,” and the middle third by the term “medium.” In a similar manner the quality records were divided into tertiles, and the thirds were designated, in order, “good,” “medium,” and “poor.” Upon the basis of this classification an individual record must fall into one of the following nine classes: rapid speed and good quality; rapid speed and medium quality; rapid speed and poor quality; medium speed and good quality; medium speed and medium quality; medium speed and poor quality; slow speed and good quality; slow speed and medium quality; slow speed and poor quality. The percentage of each grade which fell in each of the nine classes was calculated. The average percentage of cases for

TABLE XXXVIII

AVERAGE SPEED AND QUALITY SCORES IN SILENT READING OF 1,831 CLEVELAND PUPILS AND OF 2,654 PUPILS OF OTHER CITIES

Grade	Rate for Cleveland	Rate for Thirteen Cities	Quality for Cleveland	Quality for Thirteen Cities
II.....	1.96	1.50	25.2	31.5
III.....	2.57	2.30	32.1	37.3
IV.....	2.76	2.20	17.5	28.8
V.....	2.74	2.57	22.0	31.8
VI.....	3.00	2.79	26.1	39.1
VII.....	2.89	2.69	19.7	21.6
VIII.....	3.07	2.87	24.2	26.9

all the grades falling in each of the nine classes was then determined. The results are presented in Diagram XIX.

This diagram emphasizes the fact that good readers are usually not slow and poor readers are usually not fast. It is evidently not safe to lay down any absolute rule. The average teacher is confronted with pupils who might fall in any one or all of the nine classes mentioned. There are good readers who are rapid and there are good readers who are slow. There are rapid readers who retain much of what they read and there are rapid readers who retain little. The points of greatest significance revealed by the table are the facts that high rate and good quality are more commonly related than slow rate and good quality, and that slow rate and poor quality are more commonly related than rapid rate and poor quality.

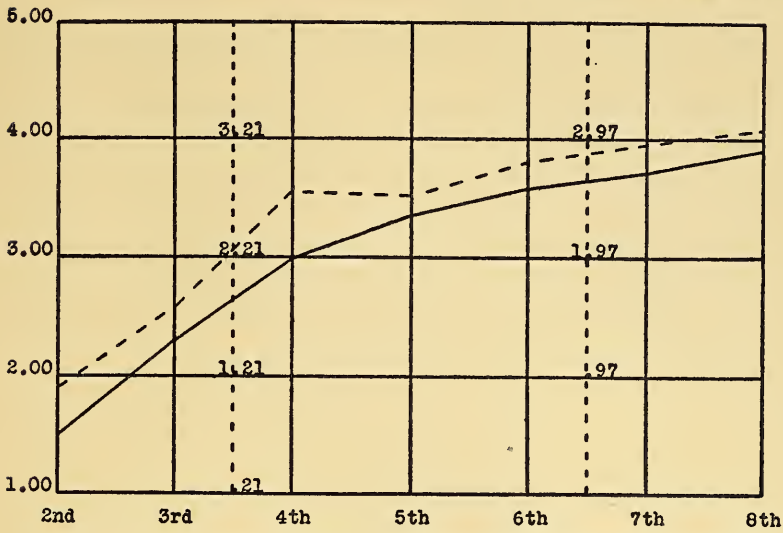


DIAGRAM XVII.—Average scores in the rate of silent reading of 1,831 Cleveland pupils and of 2,654 pupils of thirteen other cities. Dotted line shows Cleveland scores and solid line those of other cities.

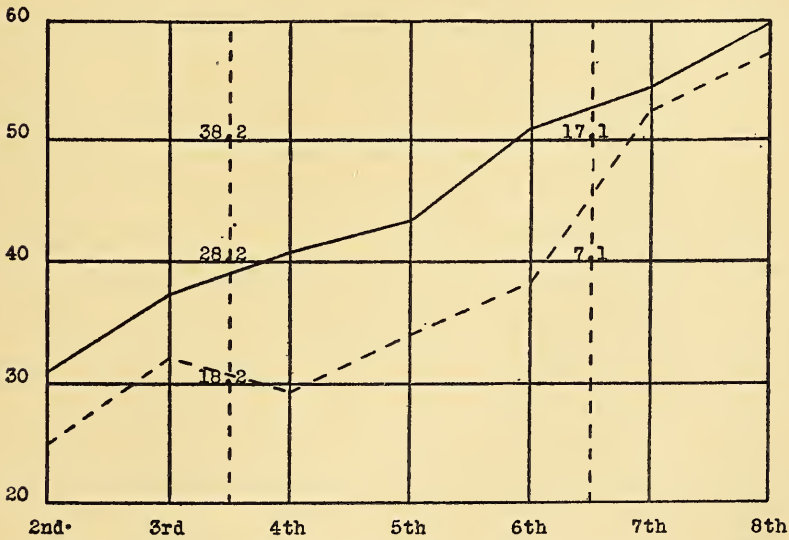


DIAGRAM XVIII.—Average scores in the quality of silent reading of 1,831 Cleveland pupils and of 2,654 pupils of thirteen other cities. Dotted line shows Cleveland scores and solid line those of other cities.

The Cleveland Survey monograph entitled *Measuring the Work of the Public Schools* reports a similar study in which the records included in this investigation were distributed as follows: In the case of speed and of quality 25 per cent of the records were included in the best group, 50 per cent of the records in the medium group, and 25 per cent of the records in the poorest group. The average percentage of records falling in each of the nine classes was determined as outlined above. The percentage for each class was as follows: rapid speed and good quality, 10; rapid speed and medium

14%	11%	8%
Rapid Speed and Good Quality	Medium Speed and Good Quality	Slow speed and Good Quality
12%	11%	10%
Rapid Speed and Medium Quality	Medium Speed and Medium Quality	Slow Speed and Medium Quality
6%	11%	15%
Rapid Speed and Poor Quality	Medium Speed and Poor Quality	Slow Speed and Poor Quality

DIAGRAM XIX.—Percentage of 1,831 Cleveland pupils found in each of nine groups in speed and quality in silent reading.

quality, 12; rapid speed and poor quality, 4; medium speed and good quality, 11; medium speed and medium quality, 26; medium speed and poor quality, 12; slow speed and good quality, 4; slow speed and medium quality, 12; slow speed and poor quality, 9.

The significant fact brought out by a comparison of these results with those reported in Diagram XIX is that each study emphasizes the same general relation between speed and quality of silent reading.

The second method of determining the relation between speed and quality in silent reading was as follows: The average comprehension score of all pupils reading 100 words in 100 seconds was

found for each grade. A similar average was found for all pupils in each grade reading 100 words in 90 seconds, 80 seconds, 70 seconds, etc. The results are presented in Table XXXIX. The table reads as follows: In the second grade the average comprehension score for all pupils who required from 98 to 102 seconds to read 100 words was 17; the average comprehension score for all pupils who required from 88 to 92 seconds to read 100 words was 19. In comparing the average scores made by the selected pupils of the various grades, it should be remembered that second- and third-grade pupils read "Tiny Tad," fourth-, fifth-, and sixth-grade pupils read "The Grasshopper," and seventh- and eighth-grade pupils read "Ancient Ships."

TABLE XXXIX

AVERAGE QUALITY SCORES IN SILENT READING OF ALL PUPILS READING AT VARIOUS RATES

Grade	100 Sec.	90 Sec.	80 Sec.	70 Sec.	60 Sec.	50 Sec.	40 Sec.	30 Sec.	20 Sec.	15 Sec.
	1 word per sec.	1.1 words per sec.	1.25 words per sec.	1.42 words per sec.	1.62 words per sec.	2 words per sec.	2.5 words per sec.	3.3 words per sec.	5 words per sec.	6.5 words per sec.
II.....	17	19	20	23	24	24	25	31	30	36
III.....	19	21	24	29	28	28	30	34	41	28
IV.....				12	15	15	17	22	22	14
V.....				13	20	20	22	26	24	33
VI.....				19	27	28	22	28	30	23
VII.....					10	17	19	20	26	28
VIII.....						19	21	25	29	18

The table shows that with few exceptions the average quality score for all pupils reading at given rates increases as the rate increases. Some few exceptions to this rule appear in the table. Had more cases been involved, it is believed that most of these exceptions would have been eliminated. It is apparent from the results presented in the table that the rate of reading may become so fast that quality is sacrificed. The average comprehension scores of the most rapid readers in the third, fourth, sixth, and eighth grades illustrate the point in question.

This analysis of the relation between speed and quality in silent reading shows very clearly the relative advantage which the more

rapid readers possess. If we accept the general principle that rapid rate and good quality usually go together, we are left with the complex problem of explaining why Cleveland pupils who read rapidly on the average are less able to give back what they read than are the pupils in other schools who were tested with the same selections.

EXPLANATION OF THE CLEVELAND RECORD

The problem with which we are confronted at this point is solved by a consideration of the relative emphasis on speed and quality in the different grades. In Diagram XX rate and quality are both represented by a single curve of progress. The rate of reading is represented along horizontal distances and the quality along vertical distances. Different grades are represented by small circles which appear at various points along the curve of progress. The readjustments in the separate diagrams for speed and for quality which were made necessary by the use of different selections are omitted from these diagrams for the sake of increased clearness and simplicity. Inasmuch as it was impossible to equate a unit of speed as represented in the diagram exactly in terms of a unit of quality, care must be observed in interpreting the curves of progress. As the diagrams are drawn, the most significant points for our consideration are revealed by the changes in the direction of progress which occur from time to time along the curve of progress.

The facts in regard to Cleveland and the other cities are presented in Diagram XX. Here we see that the rate of the second grade in Cleveland is nearly 2 words per second, while the rate of the corresponding grade in other cities is about $1\frac{1}{2}$ words per second. The quality of the second grade in Cleveland, on the other hand, is 25, while that of the same grade in other cities is 30. Following the progress of the Cleveland curve, it is noticed that there is a rapid gain in speed up to the fourth grade, shown by the fact that the curve turns sharply toward the right. The progress is irregular as to quality. There is a relapse to a lower level in passing from the third to the fourth grade. Even after improvement in quality begins in the fifth grade progress is irregular and distinctly slow at first.

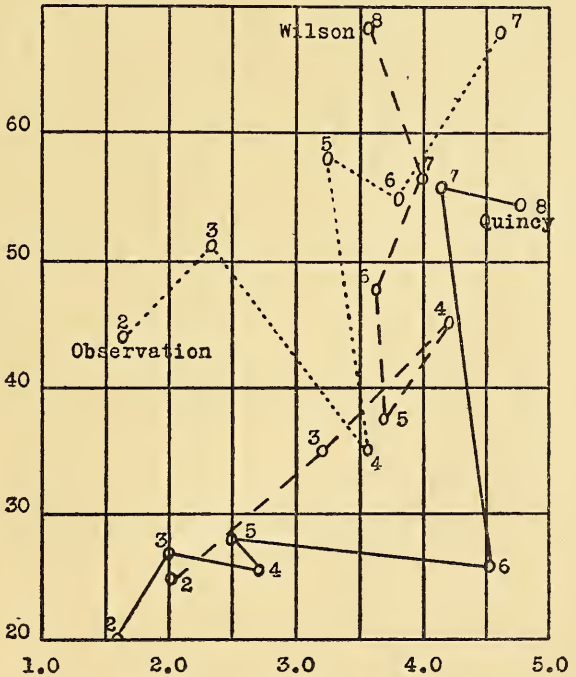
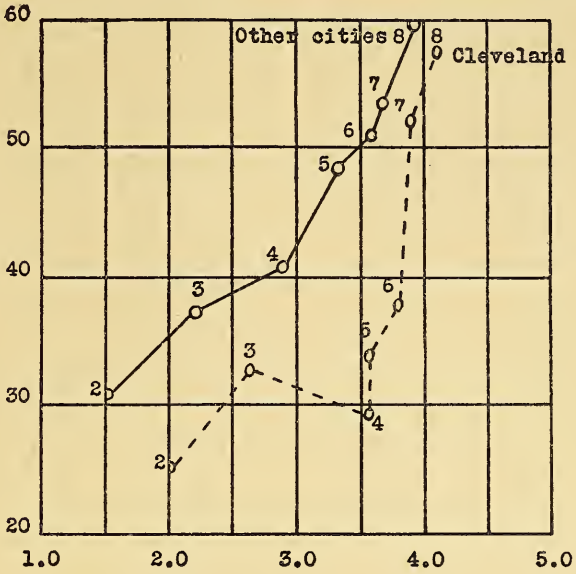


DIAGRAM XX.—Average scores in speed and quality in silent reading in each grade in Cleveland and in thirteen other cities and in three selected Cleveland schools.

The curve for the other cities has a wholly different character. During the early years rate improves relatively more than does quality, but there is steady progress in both. In the middle of the elementary course there is a definite change in relation, the upper grades showing greater improvement in quality. This would seem to mean that the mechanical phases of reading must be mastered first, and their mastery is shown by the attainment of satisfactory speed; thereafter the greater emphasis should fall on quality.

The whole solution of the problem regarding high rate and deficient quality is now clear. There is not enough attention given to the interpretation of what is read in the grades up to the fourth. There is indeed a high degree of success in perfecting the mechanical operations, as shown in the oral-reading scores and in the rate of silent reading, but the ultimate achievement of the schools is below what it should be in quality because interpretation is not adequately stressed in the lower and intermediate grades.

Achievement of various schools.—The scores for the various schools reported in this chapter are based on the records of a limited number of pupils of each grade. While it is felt that the average score for each grade serves as a fairly accurate index of its achievement, it is possible that the average score might have been slightly different had all the pupils been tested. The following comparisons of different schools are not so valuable, therefore, from the standpoint of rigid accuracy as they are suggestive of the kind of analyses which would be productive in every school system.

The lower part of Diagram XX shows the results obtained in speed and quality of silent reading in three schools. Fifteen pupils of each grade were tested in the Observation School and in the Wilson School. Seven pupils of each grade were tested in the Quincy School. The diagram shows that the Observation School makes a high record in quality of reading in all grades excepting the fourth. The relatively low score in the fourth grade presents a real problem for solution. The Wilson School makes unusually rapid progress in the second, third, and fourth grades in both speed and quality. Beyond the fifth grade progress is steady and fairly consistent. The peculiar relative achievement of the fourth and fifth grades is unusual and would suggest that the proper amount

of emphasis is not given in these grades to problems of silent reading. The curve for the Quincy School is very irregular. From the second to the sixth grade inclusive very little progress is made in quality of reading. The comparative study of the records of these schools suggests that there is real need in some schools for a clearer definition of the points to be emphasized in each grade and for a clearer realization on the part of the teacher of the specific means by which the desired goal can be attained.

SUMMARY AND CONCLUSIONS

The facts brought out in the investigation of reading in Cleveland were as follows:

1. The average achievement in oral reading reaches a high level for the city as a whole.
2. Variations among schools and among individuals of the same class are very wide.
3. Sex and nationality make for variations in oral-reading achievement. Methods of teaching reading offer very little influence when the city as a whole is considered.
4. In rate of silent reading Cleveland is ahead of thirteen other cities, but behind these cities in ability to interpret what is read.
5. In general, good quality and rapid reading commonly go hand in hand. Poor quality and slow reading are, in like manner, commonly related.

The conclusions concerning Cleveland's needs were as follows:

1. More emphasis should be laid on interpretation and relatively less on drill in formal reading.
2. In many schools there is need for a clearer definition of the phases of the work to be emphasized in each grade.
3. In the city as a whole and in each individual school there is need for co-operative effort in careful studies of the problems of teaching reading in order that scientific conclusions might be reached concerning best modes of procedure.

CHAPTER VII

SPECIAL PROBLEMS IN READING

The data secured through the use of the oral-reading and silent-reading tests point toward certain tentative conclusions in regard to many important problems in reading. It is the purpose of this chapter to present the results obtained through a study of each of the following problems: (1) periods of growth in reading achievement; (2) rates in oral reading and in silent reading; (3) relation of growth in oral-reading ability to comprehension of subject-matter read.

PERIODS OF GROWTH IN READING ACHIEVEMENT

The results of this study are based on data secured by testing 471 pupils and students of the Elementary School, the High School, the College departments, and the Graduate Schools of the University of Chicago. The distribution of the persons tested was as follows: 254 elementary-school pupils, 172 high-school students, 27 college students, and 18 graduate students. All the subjects took both the oral- and the silent-reading tests, excepting the first-grade pupils, who took the oral-reading test only.

Diagram XXI presents the curve of progress for oral reading. The solid line represents the standard achievement by grades of 2,193 pupils. The broken line represents the achievement of the classes tested for this study. The diagram shows that in general these pupils made scores which are superior to the standard oral-reading scores. The fact that the tests were given early in the year accounts for the apparent relative inferiority of the pupils of the lower grades. Since growth takes place most rapidly in these grades, a difference of two or three months makes a noticeable difference in absolute achievement.

The curve of progress may be divided arbitrarily into three parts for the purpose of this discussion. During the first, second, and third grades progress is very rapid. During the fourth, fifth, sixth, and seventh grades progress continues at a regular rate, but by no

means so rapidly as in the primary grades. At the beginning of the high-school period achievement in oral reading is at a relatively high level. Very little additional growth takes place during the high-school and college periods.

It is in harmony with natural expectation that the first two or three years of school work should be characterized by rapid growth in reading ability. The pupil at this time is devoting a great deal of his attention to the acquisition of reading habits. Every lesson brings the pupil in contact with many new words, and he has

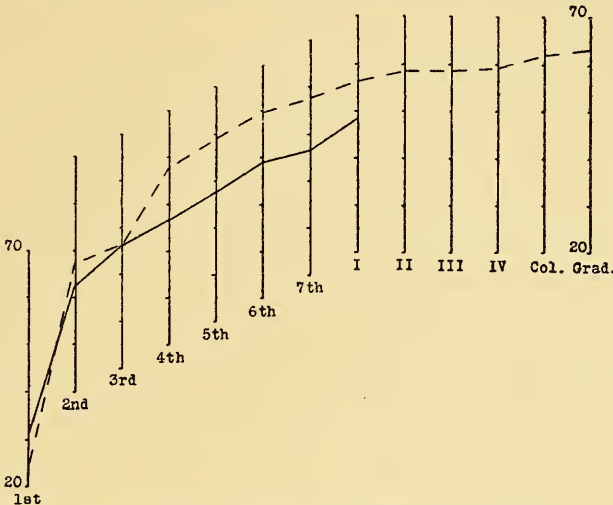


DIAGRAM XXI.—Curve of progress for oral reading

abundant opportunity to associate the sight of symbols with their proper pronunciation. The words which are learned at this time are usually within the comprehension of the pupil, and word-mastery can progress rapidly, uncomplicated by the problem of mastering meanings. Furthermore, the power of word-analysis develops so rapidly during the second and third grades that the pupil is able to pronounce at sight most of the common words by the beginning of the fourth grade.

During the fourth, fifth, and sixth grades silent reading becomes the dominant type of reading. Ability to read is now measured largely in terms of a pupil's ability to master the thought of what

he reads. The pronunciation of a very large proportion of the words is more or less familiar. Hence the opportunities for increase in oral-reading ability are much fewer than during the preceding period, and we should naturally expect progress to be less marked. On the other hand, there are factors operating which tend to increase the pupil's ability in oral reading. The subject-matter which is read brings the pupil daily into new fields of thought and in contact with some new words. In order to use these words in class discussion or even in oral reading, the pupil is constantly analyzing words or looking up their pronunciation in the dictionary. Furthermore, the pronunciation of partly familiar words becomes more rapid and accurate and the words of a selection are grouped together more economically and effectively. All of these factors result in regular progress in oral reading during the intermediate grades, although the rate of progress is less rapid than in the lower grades.

By the time a student reaches the high-school period his reading habits are definitely established. The subject-matter studied at this time repeats for the most part the reading vocabulary which the pupil has already mastered. Technical terms peculiar to certain subjects, proper names, foreign derivatives, etc., are encountered, however, from time to time, and the pupil is forced to continue his study of words. Hence there is some progress from year to year through the high-school and college period, measured largely by the scope of the student's general reading and by the character of his specialized study.

Diagram XXII presents the curve of progress for rate of silent reading. The solid line represents the standard rates for 2,654 pupils. The broken line represents the achievement of the classes tested for this study. During the second and third grades the rates at which these pupils read silently approximate the standard rates. From the fourth grade on more rapid progress is made than is indicated by the standard rates. The diagram shows that up to the sixth grade the rate at which these pupils read silently increases very rapidly. Beyond this grade progress is irregular and of no large consequence. The diagram supports in a general way the conclusion reached by Curtis that the curve for careful reading is practically constant from the sixth grade on. This means that

the rate and character of one's serious reading are fixed in early school life.

During the second and third grades a pupil is developing rapidly in his ability to recognize words at sight. It is in harmony with natural expectation that the rate of silent reading should increase rapidly at this time. As the ability to recognize words increases the power to recognize larger and larger units at a single fixation of the eye develops, with the result that during the intermediate

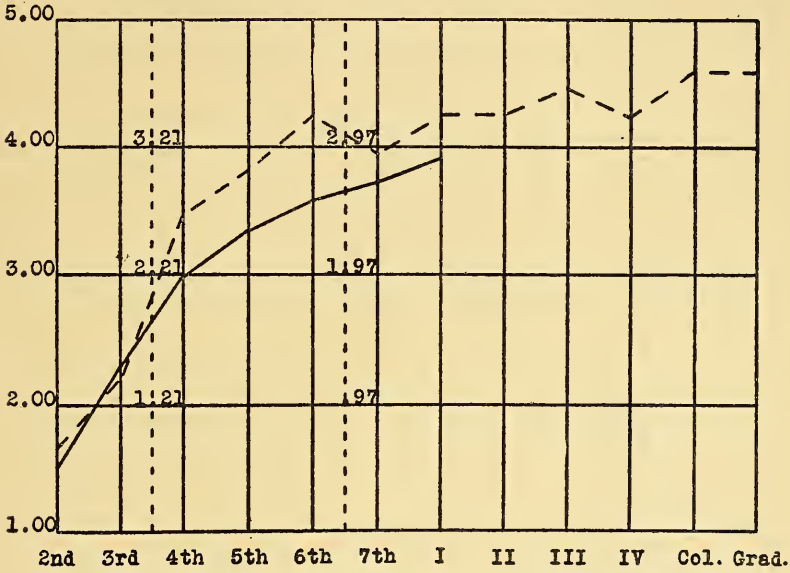


DIAGRAM XXII.—Curve of progress for rate of silent reading

grades the eye moves along the lines at a constantly increasing rate. The maximum development for careful reading is approximated in the sixth grade. Additional points of explanation will be brought out in the following paragraphs.

Diagram XXIII presents the curve of progress for quality of silent reading. The solid line represents the standard scores for 2,654 pupils. The broken line represents the achievement of the classes tested for this study. The diagram shows that the scores for these pupils are superior throughout to the standard scores. During the second grade rapid progress is made in quality of silent

reading. Progress continues through the third and fourth grades, but it is less marked. From the fifth grade on there is continuous rapid progress in the upper grades and in the high school. It is noted with some surprise that college and graduate students make lower scores than do high-school students.

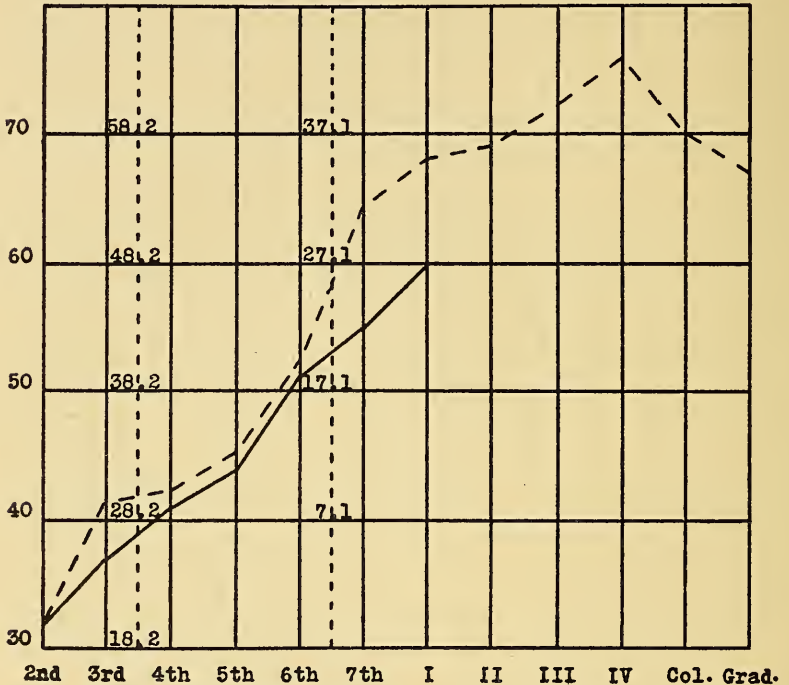


DIAGRAM XXIII.—Curve of progress for quality of silent reading

The rapid improvement in the quality of silent reading at the beginning may be explained in part by the fact that the pupil improves rapidly in his ability to use reading as a tool for getting thought. Habits of attention and study are being developed and refined. The pupil's fund of experience is being rapidly enlarged, with the result that he is able to comprehend the meaning of what he reads more adequately.

Some of the irregularities of the quality-curve for the first six years may be explained in part on the basis of the relative emphasis

which is given to speed and quality. A comparison of the curves for speed and quality shows that during the second grade speed receives relatively less emphasis than is normal, while quality, on the other hand, makes unusual progress. During the third grade speed is emphasized very largely, while there is little progress in quality. During the fourth and fifth years the growth in both speed and quality is normal. During the sixth year quality improves rapidly, but rate increases less rapidly than in the preceding grade. This comparison suggests that improvement in speed and quality of silent reading may be due, in part, at least, to the emphasis which is given to each in the classroom.

It is in harmony with natural expectation that the quality of one's reading should improve very distinctly during the fourth, fifth, sixth, and seventh grades. It is just at this time that the pupil learns to use reading in a large way as a tool to enlarge his world of meanings. He reads copiously and with a purpose. The natural result should be increased power in getting the thought of the printed page. As the pupil continues through the grammar grades and in the high school, his methods of study are improved. College and graduate students show less power than high-school pupils, according to the diagram. The explanation for this apparent decrease in reading efficiency lies largely in the fact that adults are much more self-conscious during a test than are high-school pupils. The following interesting facts were brought out as a result of observations and questioning which were carried on by the writer: first, adults are more conscious of the significance of tests than are high-school pupils; second, they are less accustomed to study under the immediate observation of others, and hence feel more confused; third, tests are found to be a severe trial in a very large proportion of the cases. These facts justify the acceptance of the above-mentioned explanation for the apparent decrease in reading efficiency of college and graduate students.

COMPARISON OF RATES IN ORAL READING AND IN SILENT READING

The subjects for this study included the 471 pupils and students of the University of Chicago mentioned in the preceding study. The subject-matter upon which the rate of oral reading is based is

paragraph 3 of the oral-reading scale. The selections upon which the rate of silent reading is based are the selections of the standard silent-reading tests. For the purpose of checking the relative difficulty of "Tiny Tad" and paragraph 3 a class of third-grade pupils were asked to read them orally. The results showed that they were practically equal in difficulty for oral reading. The average time required by the various grades to read paragraph 3 was determined and the rate was expressed in terms of the number of words read per second. The results by grades were as follows:

IA	IIA	IIIA	IVA	VA	VIA	VIIIB	First Year High School	Second Year High School	Third Year High School	Fourth Year High School	Col.	Grad.
1.00	1.86	2.45	3.15	3.51	3.80	3.90	3.90	4.10	4.00	3.98	4.02	3.80

The solid line in Diagram XXIV represents the curve of progress for rate of oral reading. The significant point about the curve is

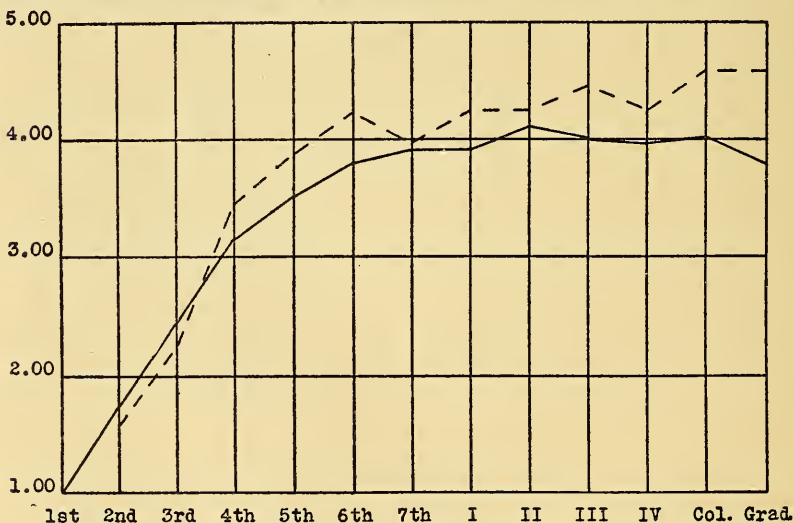


DIAGRAM XXIV.—Comparison of oral- and silent-reading rates of 471 pupils and students in the University of Chicago.

that progress continues throughout the grades and reaches a maximum rate during the high-school period. The increase in rate during the lower grades is due to the fact that words are recognized at sight with increasing rapidity and groups of words are combined into more effective units for oral expression. The very high rate

during the high-school period may be accounted for in part by the rapid offhand way in which high-school students do most easy tasks. The decrease in the rate of graduate students is due to the greater deliberateness which characterizes older people.

The dotted line in Diagram XXIV represents the curve of progress for rate of silent reading. The diagram shows that the rate of silent reading for the second and third grades is less rapid than the rate of oral reading. This is significant in view of the fact that the two selections were read orally at the same rate by a group of pupils of corresponding ability. It indicates that when a pupil is asked to read a selection for the content he may read it more slowly and more carefully than if he were reading it orally without directing special attention to the content. During the fourth, fifth, and sixth grades pupils read silently at a rate which is distinctly higher than the oral-reading rate. The fact that the rate of careful silent reading exceeds the rate of oral reading needs explanation. The ordinary child who has reached the fourth grade has had a great deal of training in oral reading, with the result that he can now use reading independently. As has been pointed out in previous paragraphs, he begins to read more rapidly than in the primary grades. He becomes interested in the subject-matter and his eyes run along the lines at a rate which surpasses the rate of vocalization. As a result we find that the rate of silent reading exceeds the ordinary rate of oral reading in the intermediate grades. It is interesting to note, on the other hand, that after the fourth grade the rate of silent reading parallels very closely the rate of oral reading. This fact suggests that the habits of oral reading which receive so much attention in the schoolroom today may have a retarding influence upon the rate of silent reading.

RELATION OF ORAL-READING ACHIEVEMENT TO COMPREHENSION OF SUBJECT-MATTER READ

The question has frequently been raised: Is it possible to develop so rapidly in ability to pronounce words that one is able to read orally subject-matter which is beyond his comprehension? This study was undertaken to determine a partial answer at least to this question.

During the winter of 1914 the oral-reading test was given to the pupils of the Elementary School of the University of Chicago. Four questions were carefully prepared for each paragraph. The questions for paragraphs 3, 7, and 11 were as follows:

PARAGRAPH 3

1. Where did the king and queen live?
2. Why were they unhappy?
3. What did they find at their door one day?
4. What did they do with the little boy and girl?

PARAGRAPH 7

1. What time of day was described in the paragraph?
2. Behind what had the sun gone down?
3. Describe the sky as it looked on this evening.
4. What is meant by "The dull mountains stood in contrast against the western sky"?

PARAGRAPH 11

1. What is meant by "The attractions of the American prairies have been overcome by the azure skies of Italy"?
2. What are antiquities of Roman architecture?
3. What are architectural studies?
4. What is meant by "My delight in these studies verges on to a fanaticism"?

The pupils read the successive paragraphs of the oral-reading test according to the usual directions. After the reading of each paragraph the pupil was asked the questions which covered that paragraph. A grade of 25 per cent was given for each question answered correctly and a grade of 12½ per cent for a partial answer. A record was made of the average score of the pupils of each class for the first selection of the test and of the average score of the class for the hardest selection which each pupil was able to read successfully. Four weeks later the test was given again. At this time the test was preceded by a fifteen-minute study-period. The following directions for the study-period were given: "You are going to take the oral-reading test again. Study the paragraphs carefully for 15 minutes so that you can read them as well as possible and so that you can answer any questions which might be asked about each paragraph."

The solid line in Diagram XXV represents the average achievement of each of the grades from IIB to VIIB inclusive for the first reading, and the dotted line represents the average achievement by grades for the second reading. The point revealed by the diagram, which is significant for the present discussion, is that the improvement in oral-reading achievement which resulted from fifteen minutes of study and from the natural growth in reading ability

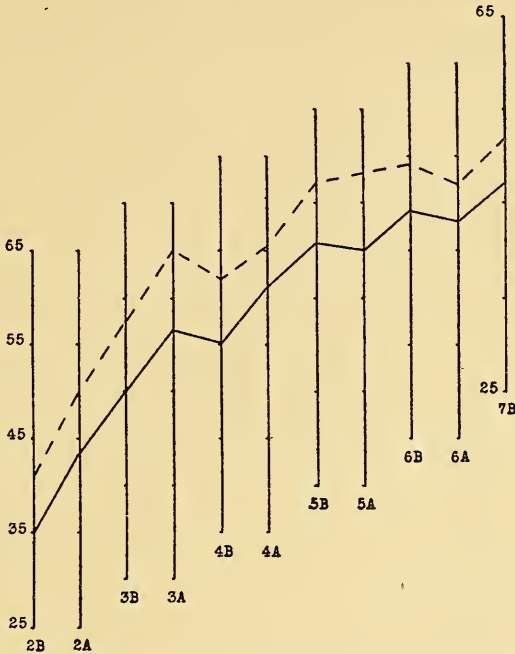


DIAGRAM XXV.—Influence of a fifteen-minute study-period on achievement in oral reading.

during one month was practically uniform throughout the grades. As a result of this uniformity any striking differences in comprehension scores will measure with a fair degree of accuracy the relation of the increase in oral-reading ability to the comprehension of what is read.

Diagram XXVI shows the influence which the increase in oral-reading ability had upon the comprehension of what was read. The curve which represents the scores made on the easiest paragraph

without study shows that the pupils of the second grade were able to answer the questions on the first paragraph practically as well as were pupils in the upper grades. Some improvement resulted from a careful study of the paragraphs. This was uniform, but not striking. Inasmuch as the paragraph was easy and the thought

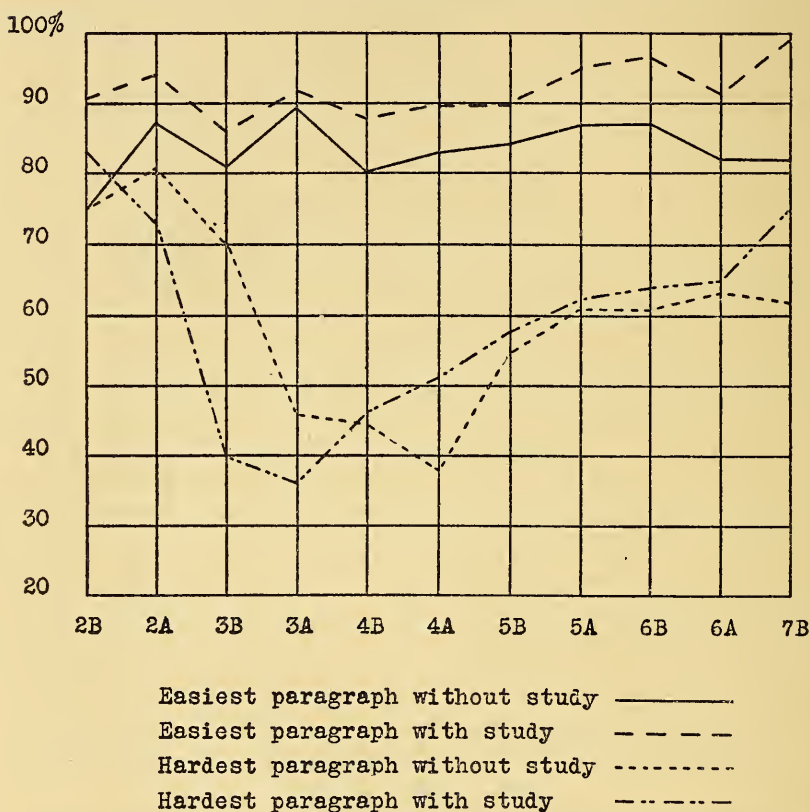


DIAGRAM XXVI.—Comprehension of the subject-matter read as related to the mastery of mechanical difficulties.

simple, the pupils of the lower grades were able to understand its meaning practically as well as the pupils of the upper grades.

The curve which represents the comprehension scores for the hardest paragraphs read without study by pupils in the second grade drops very little below the curve for the comprehension scores for

the easiest paragraph. These high scores in comprehension are easily explained by the fact that, although the pupil makes rapid progress in oral reading at this stage, he does not encounter many words whose meanings are not already familiar to him because of their frequent use in everyday conversation. Hence if the word is recognized successfully, its meaning is understood immediately. During the third and fourth grades the comprehension scores drop surprisingly. The continued rapid progress in oral reading during these grades causes the pupil to encounter a large number of new words whose meanings he has not mastered. His power of word-analysis enables him to pronounce the words successfully, but his ability to interpret the meaning of what he reads lags behind. During the fifth, sixth, and seventh grades the pupil reads widely. His world of meanings is greatly enlarged. He has become more highly trained in discovering meanings from the context as he reads. Hence we note that the curve of comprehension rises gradually during these grades in spite of the fact that oral-reading ability has been increasing constantly.

The curve for the comprehension of the hardest paragraph read with study shows some very interesting facts. Pupils of Grade IIB make a better score on the hardest paragraph read with study than on the easiest paragraph read without study. This is explained by the fact that their power to pronounce words independently at this time is so limited that it does not bring them in contact with many words whose meanings are unfamiliar. Hence the study of the paragraphs enabled the pupils to master the meaning of the hardest paragraphs more fully than they had mastered the meaning of the easiest paragraph through sight reading. Pupils of Grades IIA, IIIB, and IIIA have developed considerable ability in independent word-analysis. As a result their study of the paragraphs enabled them to read successfully paragraphs which were much beyond their comprehension. The effect of this is shown by the rapid decline of the comprehension-curve. By questioning each pupil carefully concerning his method of study during the study-period it was found that most of the pupils spent the greater part of their time analyzing words in order to pronounce them. The pupils in the grades beyond the third, however, reported more and more

emphasis given in their study to the meaning of what they read. This change in the direction of their attention, together with their increasing background of facts and meanings, enabled them to secure relatively higher scores in comprehension than they had made on easier paragraphs without study. The foregoing discussion leads to the conclusion that it is possible to advance so rapidly in ability to pronounce words that one's ability to comprehend the more difficult passages which he can read successfully is relatively decreased. This is particularly true if attention is directed to pronunciation of words rather than to meanings.

CONCLUSIONS

The tentative conclusions which have been reached as a result of the various investigations reported in this chapter relate only to the school in which the investigations took place. Whether or not these conclusions relate to all schools is a problem for further investigation. The universal value which these studies have is that they point out the presence of significant problems connected with the teaching of reading. As a result of the objective study of reading in more than two hundred schools, it is believed that there are abundant opportunities for productive studies of reading along similar lines in each classroom.

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